Technical Memorandum

To: City of Fort Lauderdale

From: Reiss Engineering, Inc., a CHA Company

Date: September 10, 2021

Re: 11858 Pilot Testing at Fiveash WTP

EXECUTIVE SUMMARY

Scope and Goals

The City of Fort Lauderdale (City) authorized an 8-week pilot scale water treatment process at its Charles W. Fiveash Water Treatment Plant (Fiveash) to identify feasibility, capital costs and operational costs of implementing additional color removal to the existing Fiveash treatment process. The pilot testing combined advanced oxidation process (AOP) options with biologically active carbon (BAC) filtration, abbreviated AOP-BAC. This report summarizes the results of a treatment process pilot study to improve color removal at Fiveash. This study was a cooperative effort with the Fiveash operational staff who provided significant input, setup, monitoring and operational support of the pilot from February 2021 to April 2021.

Process Tested

The AOP-BAC process would add an oxidant storage/feed system and utilize the existing Fiveash filters by replacing the existing dual media of sand/anthracite with granular activated carbon/sand to collectively achieve color removal while the City pursues options to replace Fiveash. The BAC is simply granular activated carbon (GAC), layered with sand in full scale filters, serving as filter media enhanced with a controlled biological growth to support organic carbon/color removal and biologically stabilize the finished water. It is well understood that GAC itself is not a viable process at Fiveash due to high raw water organic carbon levels but is commonly used as biological filtration.

Previous Work

A similar pilot study was performed at Fiveash in 1992 (Montgomery Watson, 1992) including industry-recognized water process engineers and comprehensive testing/analyses. Conclusions were compared and the color removal efficiency of final chloramination step was adopted from the 1992 report. The major differences were a 30-year time difference, lower optimal ozone dose in 2021 and the 1992 study used anthracite for its biological filtration media, this current pilot study utilized GAC.

Results Summary

2021 Fiveash pilot color removal results corroborated with 1992 with ozone the best AOP removing 60% with 2021 having significantly lower optimum dose (4 vs. 6 mg/L ozone) and total color removal projected in the 90% range including lime softening, ozone, BAC filtration and chloramination. The biological filtration using GAC outperformed the 1992 anthracite removing 90% of biodegradable dissolved organic carbon removal (BDOC) versus 50 to 70% in 1992. Lime carryover hindered transfer pumping, ultraviolet light and metering equipment.

The estimated life cycle cost of implementing an AOP-BAC process at Fiveash would be in the range of $1.18 per 1,000 gallons. Capital cost would be approximately $72,000,000 with an estimated annual operating cost of $12,700,000. These costs include ozone, BAC, lime feed improvements and contact time modifications. Full scale ozone equipment could also be leased for a term to minimize capital outlay.

Noticing that certain well combinations had very high color, one variation of the proposed system is to treat half of the Fiveash flow with AOP-BAC and half with nanofiltration allowing retirement of half of the Fiveash process train. The nanofiltration expansion is currently planned by the City; this hybrid is fully compatible with future Fiveash plans. $100,000,000 in rehabilitation costs (2017 CUSMP) were added to both alternatives to further extend the functionality of Fiveash. Total life cycle costs for the two alternatives were $2.32 and $2.53 per 1,000 gallons respectively as detailed in Tables 1 and 2.

Conclusions

- Pilot plant (Figure 1) operated for 11 weeks, AOP pilot operation was hampered by high solids carryover from the hydrotreater scaling pumps and equipment; the City is investigating clarification optimization including enhanced lime softening with recarbonation. The resulting runtime and analyses confirmed the 1992 study color removal findings with improvements in ozone dose and biological filtration efficiency.
- The total color removal that could be expected through the entire full scale process train (softening, AOP-ozonation, BAC and final disinfection is estimated at ~90% (consistent with 1992 study 89% finding). For an average raw water color of 56 color units, an average finished water color of 6 is projected based on a transferred ozone dose of 4 mg/L, a chlorine dose of 8 mg/L and an ammonia dose of 1 mg/L (Final chlorination color removal and dosages were adopted from the 1992 study).
- Ozone by itself was the best color removing advanced oxidative process (AOP) removing 60-75% of color from the hydrotreater effluent, however, hydrotreater lime carryover requires lime clarification to be optimized for this option to be feasible.
- No bromide or bromate was detected in the 5 samples analyzed over the 3-month pilot when using ozonation treatment at the 3 to 6 mg/L ozone dose tested.
- Pilot feed pH ranged from 9 to 10; no pH adjustment was performed during the pilot study, however, the lime carryover does need to get minimized by improving the consistency of the lime softening clarification process, possibly by retrofitting lime feed equipment, optimizing lime dosing and testing alternate settling enhancers, to mitigate equipment scaling.
- Pilot feed water (hydrotreater effluent) color varied from 10-70, averaging 40 color units. Feed water quality was highly variable with significant turbidity during the pilot.
- Ozone converted between 0.5 and 1.1 mg/L of the average feed water 8 mg/L of dissolved organic carbon (DOC) to biodegradable dissolved organic carbon (BDOC); the biological activated carbon (BAC) process (Column #1 only) removed over 90% of the BDOC, producing a biologically stable water. This result along with heterotrophic plate count (HPC) analyses showed that the GAC system functioned as a BAC system.
- The GAC did initially provide adsorptive color and DOC removal, however, the initial color increase occurred quickly in the BAC Column #1 at approximately 500 bed volumes but continued to remove color and TOC indicating biological action past 2,000 bed volumes to the end of the valid pilot run.

- After the adsorptive phase exhaustion, BAC Column #1 removed from 40 to 80% removal of AOP effluent color at an empty bed contact time (EBCT) of 8.5 minutes and a pH of 9 to 10, until color breakthrough indicated the need for backwash; with removal due to BDOC removal and possibly the filtration process. BAC Column #2 performed similarly.
- BAC Column #1 had color breakthrough at 1,700 bed volumes. BAC columns were backwashed (as full scale Fiveash scale filters are periodically) thereby restoring the color removal in BAC #1.
- The early exhaustion of the GAC is due to the high content of organics in the softened water (8 mg/L). GAC without biological action is applicable when TOC is < 3 mg/L.
- The City is considering a new plant to replace most of Fiveash at the wellfield; a hybrid alternative was developed to treat half the flow via AOP-BAC and half via robust TOC removal, e.g., nanofiltration.
- The advantages of the AOP-BAC process are that it can be implemented quickly, the BAC requires no structural changes to the filtration, could be deployed on only half the Fiveash process train, and the ozonation could be deployed on a temporary basis (leased) to cover the 5-year gap from now until a new Fiveash facility is operational.
- The assumption was to use the existing recarbonation basins for ozone contact time to minimize cost, if the City implemented enhanced softening with recarbonation, separate ozone contact would be required probably limiting the viability of this option. Enhanced lime softening is not required for AOP-BAC to be viable, but more consistent operation of the lime clarifiers would be as mentioned above.

Figure 1. Pilot Plant Layout

Recommendations

- Continue with efforts to optimize the lime softening process and minimize hydrotreater effluent turbidity/carryover.
- Consider testing retrofitting one filter with sand + granular activated carbon (GAC) to confirm the operability of GAC as a filtration media.
- Review Fiveash replacement plans and consider implementing full or split AOP-BAC process for either short- or long-term color removal for improvement/replacement of Fiveash with costs shown in Tables 1 and 2.
- AOP equipment could be centrally located just south of the Maintenance Building (as proposed in 1992) or split and located adjacent to each hydrotreater train.

Table 1. Fiveash Cost Estimate - Option 1 (Add AOP-BAC to Existing Fiveash WTP)

Item	Capital Cost	Annual Operating Cost	Equivalent Annual Cost	Unit Water Cost, $/1000 gal
Optimize Lime Softening	10,000,000	1,000,000	1,650,510	0.11
Ozonation System	48,645,000	2,000,000	5,164,406	0.35
Biofiltration Media*	4,800,000	9,600,000	9,912,245	0.68
Disinfection Contact Time Modifications	8,000,000	100,000	620,408	0.04
Fiveash Rehab and Operation	100,000,000	10,000,000	16,505,100	1.13
Total	171,445,000	22,700,000	33,852,669	2.32

** $1.60/lb of GAC at 45 MGD design flow and 8.5 minute EBCT*

Table 2. Fiveash Cost Estimate - Option 2 (Add 50% Nano, 50% Ozone/BAC to Existing Fiveash WTP)

Item	Capital Cost	Annual Operating Cost	Equivalent Annual Cost	Unit Water Cost, $/1000 gal
Nanofiltration at Wellsites (50-60% treatment)	120,000,000	5,000,000	12,806,120	0.88
Optimize 1 Set of Lime Softening	6,000,000	600,000	990,306	0.07
Ozonation System for 1/2 flow	27,000,000	1,300,000	3,056,377	0.21
Biofiltration Media for 1/2 flow	2,400,000	4,800,000	4,956,122	0.34
Disinfection Contact Time Modifications	8,000,000	100,000	620,408	0.04
Fiveash Rehab and Operation	100,000,000	8,000,000	14,505,100	0.99
Total	263,400,000	19,800,000	36,934,433	2.53

Assumptions:

Equivalent Annual given Present Value, 30 years:	0.06505	
ADF =	40	mgd
I =	5%	

INTRODUCTION

The City of Fort Lauderdale provides potable water and wastewater service to City and surrounding community residents. The City's Utilities Division a part of the Public Works Department manages, operates and maintains the City's water and wastewater utilities.

The City's Charles W. Fiveash Water Treatment Plant (Fiveash) provides potable water to over 75% of the service area. Total designed treatment capacity is 70 MGD of produced water, however, water use permit restrictions limit the output to approximately 40 MGD. Fiveash consists of 29 active production groundwater wells, aeration, lime softening, and media filtration followed by storage and high service pumping. Disinfection is provided with chloramine addition to the softened and filtered finished water.

A pilot scale water treatment process was mobilized and operated from February to April 2021 at Fiveash to identify feasibility and operational and capital costs associated with implementing an advanced oxidation process (AOP) combined with biologically active carbon (BAC) treatment, abbreviated AOP-BAC, to replace the existing dual media in the filters and provide short term color removal while City pursues options to replace the WTP. The BAC is simply granular activated carbon (GAC) that is allowed to have controlled biological growth to support organic carbon/color removal and biologically stabilize the finished water.

While Fiveash produces safe reliable drinking water, color levels within the CITY's finished water have been an area of concern for the City's staff, customers and business. While evaluating the facility during the Comprehensive and Strategic Utilities Master Plan, the City inquired about viable options to reduce the color to a level below visual observation, less than five color units, in the finished water.

METHODOLOGY

Pilot plant set up and methodology is summarized in Attachment C. The pilot essentially inserted an AOP-BAC at the point of hydrotreater effluent to recarbonation basins. The pilot was run for 11 weeks with assistance from Fiveash operations staff. Water samples were sent to NELAC certified laboratories for the given analytes. Results were recorded, included as Attachment D and summarized below.

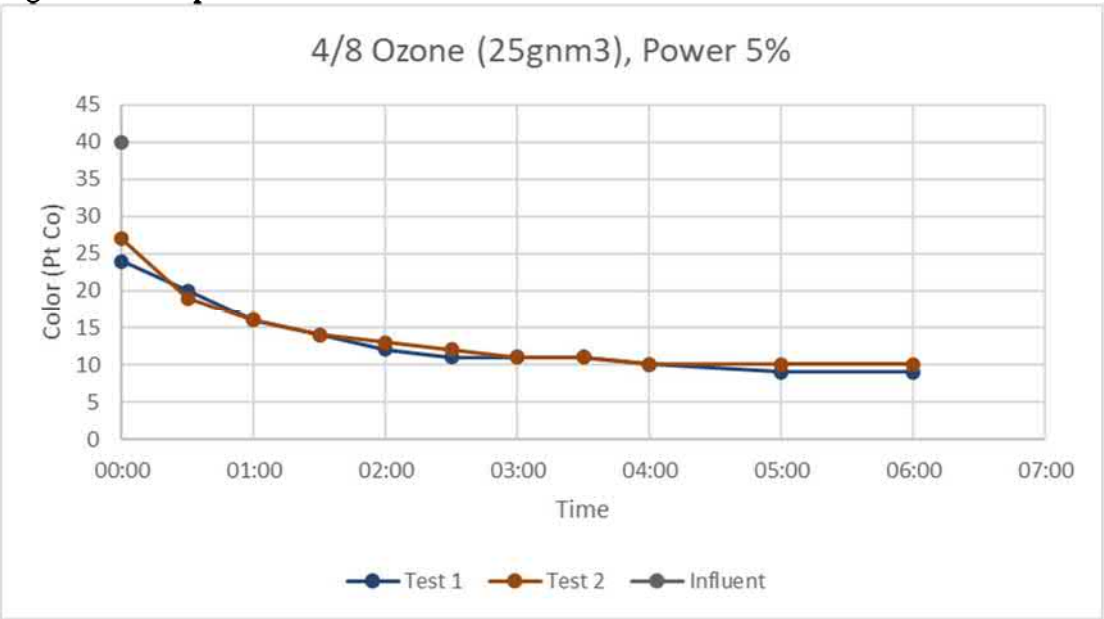
The GAC/BAC system consisted of four (4) columns operated in series. While the 3rd and 4th GAC/BAC columns were operated the entire pilot duration the results were discounted as the existing Fiveash filters would not have enough volume for the 3rd and 4th columns to be feasible full scale. Each column had 3.33 feet of GAC to simulate what could be done at full-scale plant in the existing filters. The empty bed contact time (EBCT) for Column # 1 was approximately 8.5 minutes and would be equivalent of the EBCT if full-scale filters were retrofitted with 3.33 ft of GAC/sand and operated at design flow of 45 MGD. The empty bed contact time for Column # 2 was also approximately 8.5 min and the EBCT of two column system would be 17 min and equivalent of the EBCT if full-scale filters were retrofitted with 3.33 ft of GAC and operated at max flow of 45 MGD.

RESULTS

AOP Color Removal – AOP color removal ranged from 0 to 75% for the oxidants tested as follows:

- Hydrogen peroxide (Peroxide) – 22% for 5 mg/L and 47% for 10 mg/L
- Ultraviolet radiation (UV) – 0% for the limited testing; hydrotreater carryover fouled the UV system quickly
- Peroxide + UV – limited color removal observed, however, influent color was low on the day tested and UV function was limited for retesting based on fouling
- Ozone – 60 to 75 % color removal (consistent and in some cases higher than the 1992 ozone pilot study (1992 Study), there were some lower removals observed due to high influent color (not enough ozone was applied) or very low influent color (see Figure 2 for example and Attachment B for summary of results)
- Ozone + Peroxide – 55% average color removal; similar or less than ozone itself

Figure 2. Example AOP-Ozone Color Removal Test Results

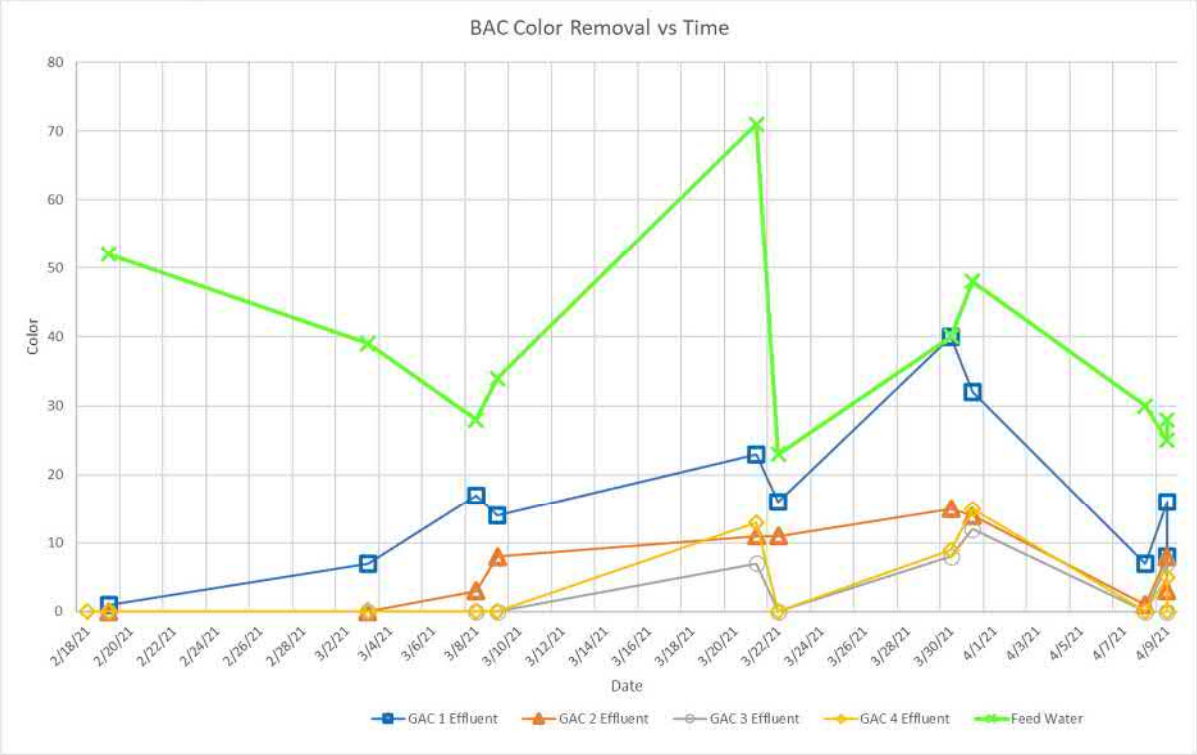


BAC Color Removal – BAC color removal ranged from 40 to 80% as follows:

- BAC Column #1 (BAC #1) – BAC #1 was operated during startup to try to establish biological activity. BAC#1 initially performed as a GAC system (adsorption being the principal mechanism of color/organic removal).
- A color increase occurred after 500 bed volumes, indicating the end of the adsorptive removal phase. Following 500 bed volumes BAC #1 operated as a biological filter with color removal from 40% to 80% until 2,300 bed volumes as shown in Figure 3 and summarized in Attachment C. BAC #1 required backwashing at 2,300 bed volumes due to sitting up for a week and accumulating algae. BAC #1 was not backwashed, however, color removal continued in BAC #2 and surrogated the BAC #1 color removal results after this point in time, as full color breakthrough occurred in BAC #1.

- BAC Column #2 (BAC #2) – BAC #2 was also operated during startup, with the initial color increase also occurring also around 500 bed volumes. Following 500 bed volumes BAC #2, operated in series downstream of BAC #1, functioned as a biological filter to provide 40 to 80% color removal vs. BAC #1 effluent.
- BAC color removal was likely a combination of adsorption, biological activity and filtration including the lime softening fines.
- BAC #1 exceeded inflow color at approximately 1600 bed volumes, the BAC columns were backwashed and color removal was restored to previous levels. This concurs with the City's normal backwashing requirements.

Figure 3. Example BAC Color Removal Test Results



AOP Oxidant and Location – Ozone by itself clearly performed the best for color removal for the source water piloted. The pilot was placed just downstream of the hydrotreater as in the 1992 study and significant lime carryover was present during the testing. City operation staff are investigating moving to enhanced lime softening with higher pHs and adding the recarbonation step. The lime carryover was depositing on equipment and AOP operation was reduced to intermittent to control fouling in pipes, pumps and flow meters. It should be noted that no issues with the ozone injection were observed and pumping and metering would not be necessary for full scale assuming the recarbonation basins work for contact. The Fiveash filters are clearly a key part of the process tasked with removing the lime solids escaping the hydrotreaters. 450' of piping was extended to test the AOP on the Fiveash raw water upstream of lime softening and aeration, however, influent color in the 70 range was observed during the day the raw was tested and not enough ozone was available as roughly 30 to 40% color removal was observed. Higher ozone doses would likely have been more effective on the raw but also would increase cost.

Influent Color – Fiveash raw and hydrotreater effluent color was highly variable. Raw color varied from 30 to over 70 and hydrotreater effluent color similarly varied from 10 to 70. This variability should be considered in planning Fiveash improvements. At certain times during the pilot, the Fiveash pre-chlorination was reinstated for necessity; the pre-chlorination reduces color by approximately 50% based on previous studies.

Results: Bromate – The bromide and bromate testing indicated no issue for bromate with all samples at or below detection limits while using ozonation treatment. Noting that the source water quality is highly variable depending on the wells in use at a given time; bromate was not observed following ozonation.

Results: Biodegradable Dissolved Organic Carbon (BDOC) – BDOC is a measure of how much dissolved organic carbon is available for assimilation by organisms in the BAC process. Results for two BAC influent versus one BAC #1 and #2 effluent each were improved versus 1992 as the BAC removed significantly more BDOC than the anthracite biofilter in 1992:

- The hydrotreater effluent (AOP pilot influent) total organic carbon (TOC) ranged from 6 to 10 mg/L and was almost all dissolved (DOC).
- Ozone did not reduce the TOC or DOC significantly at the doses tested, the 1992 study observed a 5% DOC reduction in lower doses.
- Ozone converted approximately 0.5 to 1.1 mg/L of the DOC to BDOC.
- The BAC stage 1 column removed over 90% of the BDOC produced by ozonation, well after the stage 1 GAC adsorptive removal was exhausted, leaving low levels (close to detection limits) of BDOC in the effluent. Heterotrophic plate count (HPC) sampling also indicated the presence of biological activity in the BAC columns. Therefore, the GAC system was biologically active and low resulting BDOC levels would indicate the BAC produces a biological stable water.
- It should be noted that TOC removals nearing 50% were observed in BAC #1 and #2 in the 1,500 to 2,000 bed volume range except with BAC #1 required backwashing. Due to the limited duration of the pilot and the BAC #1 backwashing issue it is not known if this TOC removal could extend past 2,000 bed volumes, however, given that the GAC's adsorptive capacity was exhausted it is probable that this TOC removal process was biological/filtrative and could continue.

Design Criteria – The resulting recommended AOP and BAC design criteria are presented in Table 1, including reduced lime carryover from the hydrotreaters. Ozone contact time in the 5-minute range would be achieved in the existing recarbonation basins with some minor modifications; this should be verified. Design criteria for AOP-BAC are presented in Table 3.

Table 3. AOP-BAC Preliminary Process Criteria

Item	Component	Criteria	Units
Lime Softening Optimization (separate effort by City)			
	Design Conditions		
		Effluent lime turbidity	Minimized, potentially via the City's ongoing efforts to optimize, potentially raising pH and utilizing recarbonation.
Ozonation System			
	Design Conditions		
		Design Flow	45 mgd
		Average Flow	40 mgd
		Max Ozone Dose	6 mg/L
		Average Ozone Dose	4 mg/L
		Number of generators	2 to 4 #
	Ozone Generation		
		Max Ozone Generation	3,000 lb O3/day
		Average Ozone Generation	2,000 lb O3/day
		Number of trains	2 #
	Oxygen Production/Storage		
		Maximum Oxygen Production	25 ton/day
		Average Oxygen Production	10-20 ton/day
Biologically Active Carbon			
	Sand		
		Effective size	0.5 mm
		Uniformity Coefficient	<1.4
		Existing Filter Sand Depth	7 inch
		Proposed Filter Sand Depth	7 inch
	Granular Activated Carbon		
		Carbon Type	Granular Activated
		Carbon Tested	Calgon
		Empty Bed Contact Time	5-10 minutes
		Surface Loading Rate	2-4 gpm/ft^2
		Existing Filter Anthracite Depth	18 inch
		Proposed Filter GAC Depth	30 inch
	Anthracite (optional)		
		Effective size	0.5 mm
		Uniformity Coefficient	<1.4
		Existing Filter Anth. Depth	18 inch
		Proposed Filter Anth. Depths	30 inch
Disinfection Contact Time Modifications			
		Contact Time	90 minutes
		Contact time improvements	Add baffle walls to exsiting storage, add piping and possibly transfer pumping

Potential Treatment Alternatives – noting that the City is contemplating moving forward with constructing a brand new WTP on the wellfield site to partially replace Fiveash. Fiveash would still function for storage and repumping. Two AOP-BAC process upgrade alternatives were developed to improve Fiveash as follows:

1. Rehab Fiveash treatment processes and add ozone plus biofiltration for color removal.
2. Implement a new membrane softening process to treat 50-60% of the flow, recover the concentrate to Fiveash and run the other 50% raw water thru 1 set of lime softening hydrotreaters abandoning the other set. Membrane softening/total organic carbon removal would operate 80-85% recovery and the concentrate would be routed to Fiveash in the existing, unused transmission pipe for treatment in Fiveash' lime softening or converted concentrate recovery process.

Estimated Costs – Estimated AOP-ozone capital, operating and unit water costs are provided in Tables 4 and 5.

Table 4. Ozonation System Capital Cost Opinion

	Quantity	Total Cost (40.0 MGD)
Lime Softening Operations Optimization	1	Optimize the lime process and clarification to produce a lower turbidity effluent, e.g., new lime feed system
Ozone Generation System (see Attachment E): - Two ozone generators - Two LOX tanks with vaporization system - Closed loop HEX cooling system - Two side stream injection systems - Two ozone destructors - One ozone control panel - Instruments and monitors	1	$8,000,000
Construct enclosure, install equipment	1	$10,000,000
Dissipation Chamber/Piping	1	$500,000
Additional piping, bypass and valves	1	$5,000,000
Sitework, demo, connections	1	$4,500,000
Yard Piping for LOX	1	$1,500,000
Electrical and I&C	1	$5,000,000
Sub-Total		$34,500,000
Design/Construction Inspections	8%	$3,450,000
General Conditions	3%	$1,035,000
Contractor O&P	10%	$2,760,000
Contingency	20%	$6,900,000
TOTAL		**$48,645,000**

Table 5. Ozonation System Operation Cost Opinion

	Unit Cost	Cost @ 40.0 MGD
Power	$0.13/kWh	$850,000
LOX	$0.06/lb	$500,000
Maintenance	Lump sum	$300,000
TOTAL		**$1,650,000**

1. Power: $0.13/kWh
2. LOX: $0.06/lb (FY2018 Orange County Bid, escalated)
3. Ozonation maintenance costs estimates based on real costs incurred by Toho Water Authority
    a. Maintenance of ozone analyzers, UV lamp modifications, degas separator valve buttons replacement, heat exchanger spare plates and gaskets, cooling water strainers
    b. Replacement of catalyst for destruct
    c. Ozone meter cleaning and calibration

It is estimated that the granular activated carbon in the BAC would cost $4,800,000 to retrofit into the existing Fiveash filters and that carbon replacement would occur twice per year. Costs for the other options were estimated based on the best available information. 2 mgd nanofiltration trailer mounted skids that could be located at each well if preferable were used to estimate the membrane softening/total organic carbon removal costs. 2 mgd skids cost approximately $5M each (per Pall Corporation) and installation estimated at an additional $5M.

END OF TECHNICAL MEMORANDUM

Attachments Below:

A – Pilot Methodology
B – AOP Results
C – BAC Results
D – Laboratory Results and COCs
E – Ozone Equipment Quotation

Attachment A – Pilot Methodology

The pilot testing is divided in two (2) phases

Phase 1. The first phase of the pilot study is to test different AOP systems over a one-week period. The different AOP systems that will be tested are:

1. Ozone
2. Ozone + Hydrogen peroxide
3. Ozone + UV

Phase 2. The second phase of the pilot study is to test the most efficient AOP system to remove color followed by biological activated carbon (BAC) over an eight-week period.

I. Pilot Testing Systems

I.1. AOP System

The AOP system is an integrated skid that contains an ozone system, an UV system, and a hydrogen peroxide feed system.

The AOP unit needs to be installed within a building. The unit is designed to run on 208 VAC, 3 Phase, 60Hz, 30 Amp. The power hook up needs to be performed by a licensed electrician.

I.2. BAC System

The BAC system consists of four (4) six-inch columns that can contain up to 4 feet of GAC. Two columns will be operated in series.

The BAC unit needs to be installed within a building. One 110V outlet is required for the pump pumping water to the GAC unit.

AOP System (SPARTOX A30 OZONE/UV)

BAC System

II. Water to be Treated

The different systems will be tested on the lime softened unchlorinated water.
The City will indicate to REI where the water should be drawn from (existing tap) and REI will pipe from the tap to the units using PVC pipes.

III. AOP Pilot Testing – Phase 1

The first phase of the pilot study is to test different AOP systems over a one week-period. The different AOP systems that will be tested are:

1. UV
2. Ozone
3. Hydrogen peroxide + Ozone
4. Hydrogen peroxide + UV (185 + 254 nm wavelength)
5. Ozone + UV (185 + 254 nm wavelength)
6. Peracetic Acid

SEE TABLE 1 FOR ANALYSIS

UV Testing

1. Switch the UV light on
2. Record intensity I (around 4 mW/cm2)
3. Set the water flow to 30 gpm
4. Analyze UV and Color in influent and effluent (after 0.45 um filtration)
5. Set the water flow to 20 gpm
6. Analyze UV and Color in effluent (after 0.45 um filtration)

7. Set the water flow to 10 gpm
8. Analyze UV and Color in effluent (after 0.45 um filtration)

The UV dose (mJ/cm2) is calculated as follows: I (mW/cm2) x 673 / Flow (gpm)
At 30 gpm the dose would be around 90 mJ/cm2

Hydrogen Peroxide and UV Testing
The hydrogen peroxide is a 35% solution
Dilute to obtain a 0.35% solution: 38 mL of 35% solution in 1 gal of DI (or 10 mL in 1 L of DI): put DI water in bucket first then hydrogen peroxide.

1. Select the water flow for the best UV testing results in terms of color removal
2. Record intensity I (around 4 mW/cm2)
3. Set the hydrogen peroxide dose to 5 ppm
4. Analyze UV and Color in influent and effluent (after 0.45 um filtration) and pH effluent
5. Set the hydrogen peroxide dose to 10 ppm
6. Analyze UV and Color in effluent (after 0.45 um filtration) and pH effluent
7. Set the hydrogen peroxide dose to 15 ppm
8. Analyze UV and Color in effluent (after 0.45 um filtration) pH effluent
9. Assess if there is any improvement by increasing the dose

If flow is 10 gpm and dose is 5 ppm, the feed rate of the chemical pump should be: 50 ml/min (using the 0.35% solution)

Ozone Testing
1. Switch the Ozone unit on
2. Set ozone power to 50%
3. Set water flow to 30 gpm
4. Record ozone concentration (back of the unit) in g/NM3
5. Record backpressure of ozone generator (psi)
6. Analyze ozone residual in effluent (right after venturi)
7. Analyze UV and Color in influent and effluent (after 0.45 um filtration)
8. Set the ozone power to 75%
9. Analyze ozone residual in effluent (right after venturi)
10. Analyze UV and Color in effluent (after 0.45 um filtration)
11. Set the ozone power to 100%
12. Analyze ozone residual in effluent (right after venturi)
13. Analyze UV and Color in effluent (after 0.45 um filtration)
14. **SAMPLE FOR TOC/DOC/BDOC/BROMIDE/BROMATE (TABLE 1) ASSESS WHAT BEST TEST IS BEFORE SAMPLING. MAY HAVE TO GO BACK TO PREVIOUS SETTING**

Hydrogen Peroxide and Ozone Testing
The hydrogen peroxide is a 35% solution

Dilute to obtain a 0.35% solution: 38 mL of 35% solution in 1 gal of DI (or 10 mL in 1 L of DI): put DI water in bucket first then hydrogen peroxide.

1. Select the ozone power for the best Ozone testing results in terms of color removal
2. Set water flow to 30 gpm
3. Record ozone concentration (back of the unit) in g/NM3
4. Record backpressure of ozone generator (psi)
5. Analyze ozone residual in effluent (right after venturi)
6. Set the hydrogen peroxide dose to 5 ppm
7. Analyze UV and Color in influent and effluent (after 0.45 um filtration) and pH effluent
8. Set the hydrogen peroxide dose to 10 ppm
9. Analyze UV and Color in effluent (after 0.45 um filtration) and pH effluent
10. Set the hydrogen peroxide dose to 15 ppm
11. Analyze UV and Color in effluent (after 0.45 um filtration) pH effluent
12. Assess if there is any improvement by increasing the dose
13. **SAMPLE FOR TOC/DOC/BDOC/BROMIDE/BROMATE (TABLE 1) ASSESS WHAT BEST TEST IS BEFORE SAMPLING. MAY HAVE TO GO BACK TO PREVIOUS SETTING**

Ozone and UV Testing

1. Select the water flow for the best UV testing results in terms of color removal
2. Record water flow
3. Record intensity I (around 4 mW/cm2)
4. Set ozone power to 50%
5. Record ozone concentration (back of the unit) in g/NM3
6. Record backpressure of ozone generator (psi)
7. Analyze ozone residual in effluent (right after venturi)
8. Analyze UV and Color in influent and effluent (after 0.45 um filtration)
9. Set the ozone power to 75%
10. Analyze ozone residual in effluent (right after venturi)
11. Analyze UV and Color in effluent (after 0.45 um filtration)
12. Set the ozone power to 100%
13. Analyze ozone residual in effluent (right after venturi)
14. Analyze UV and Color in effluent (after 0.45 um filtration)
15. **SAMPLE FOR TOC/DOC/BDOC/BROMIDE/BROMATE (TABLE 1) ASSESS WHAT BEST TEST IS BEFORE SAMPLING. MAY HAVE TO GO BACK TO PREVIOUS SETTING**

Table 1 presents the locations and water quality parameters that will be analyzed for the AOP system influent and the different AOP system effluents.

Attachment B – AOP Pilot Results

Table B-1. AOP Testing - UV Results

		UV	
Date	8-Feb	8-Feb	8-Feb
Flow (gpm)	30	20	10
UV (mW/cm^2)	0.4	0.4	0.4
UV (mJ/cm^2)	9.0	13.5	26.9
Color (Influent)	22	20	21
Color (Effluent)	22	20	20
UV254 UVT (Influent)	55.70	57.02	57.20
UV254 UVT (Effluent)	56.35	56.38	57.41
UV254 UVA (Influent)	0.254	0.244	0.243
UV254 UVA (Effluent)	0.249	0.249	0.241

Table B-2. AOP Testing - Peroxide + UV

	Peroxide + UV	
Date	8-Feb	9-Feb
Peroxide Dose (ppm)	5	13
Flow (gpm)	30	18
UV (mW/cm^2)	0.4	0.4
UV (mJ/cm^2)	9.0	15.0
Color (Influent)	8	11
Color (Effluent)	10	14
Color Removal	--	--
UV254 UVT (Influent)	61.54	63.80
UV254 UVT (Effluent)	59.96	61.66
UV254 UVA (Influent)	0.211	0.195
UV254 UVA (Effluent)	0.222	0.210
pH (Influent)	10.2	9.9
pH (Effluent)	10.1	9.9
Sulfide (Influent) ug/L		8

Table B-3. AOP Testing - Ozone

							Ozone							
Date	9-Feb	9-Feb	18-Feb	19-Feb	22-Mar	30-Mar	8-Apr	8-Apr	8-Apr	9-Apr	13-Apr	28-Apr	28-Apr	6-May
Time			9:00	13:00							10:25	Morning	Afternoon	
Power	50%	100%	100%	5%	100%	100%	5%	10%	100%	100%	100%	100%	100%	
Flow (gpm)	30	20	14	16	10	13	11	11	11	11	11	11	11	
Gas Flow (lpm)	3	3	3	3	3	3	3	3	3	3	3	2.5	2.75	
Ozone Concentration (g/Nm3)	93.15	88.85	91.8	23	96	94.3	25	45	90	95	88	83	85.3	
Backpressure (psi)	25	24	24	24	NA	25	25	25	25	26	18	19	20	
Ozone Residual (mg/L)	0.00	0.14	0.69	0	0.01	0.12	NA	NA	NA	NA	NA	0.05	0.09	O
Color (Influent)	15	19	25	5.5	92	67	40	36	30	52	56	37	50	
Color (Effluent)	10	15	10	0.5	73	54	10	11	7	14	2	9	26	
Color Removal	30%	22%	61%	91%	21%	20%	76%	69%	76%	72%	96%	76%	48%	
UV254 UVT (Influent)	59.63	59.19	57.08	65.61	NA	NA	NA	NA	NA	NA	56.94	55.87	55.77	
UV254 UVT (Effluent)	64.05	64.44	73.696	71.97	NA	NA	NA	NA	NA	NA	68.84	69.22	68.48	
UV254 UVA (Influent)	0.225	0.228	0.244	0.183	NA	NA	NA	NA	NA	NA	0.245	0.253	0.254	
UV254 UVA (Effluent)	0.194	0.191	0.133	0.143	NA	NA	NA	NA	NA	NA	0.162	0.160	0.164	
pH (Influent)	10.4	9.6	9.2	10	NA	10	NA	NA	NA	NA	9.8	9.5	9.5	
pH (Effluent)	10.4	9.6	9.2	10	NA	NA	NA	NA	NA	NA	9.8	9.6	9.6	
ORP (Influent) (mV)	91	96	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
ORP (Effluent) (mV)	190	382	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Sulfide (Influent) ug/L	46	NA	0	12	NA	NA	NA	NA	NA	NA	NA	NA	NA	
DO (Influent)	NA	NA	0	0	NA	NA	NA	NA	NA	NA	0	0	0	
DO (Effluent)	NA	NA	Over	7.9	NA	NA	NA	NA	NA	NA	11.9	12	12.1	
Raw Bromide (ug/L)			0.2	0.2	0.2								0.2	0.2
Ozone Effluent Bromide (ug/L)			0.2	0.2	0.2								0.2	0.2
Raw Bromate (ug/L)			3.7	3.7	NA								3.8	3.8
Ozone Effluent Bromate (ug/L)			3.7	3.7	3.8								3.8	3.8
Raw DOC (mg/L)			7.8	6.6	6.7								8.1	7.4
Ozone Effluent DOC (mg/L)			7.6	6.6	6.9								9.7	7.6
Raw TOC (mg/L)			7.9	6.9	6.7								7.6	7
Ozone Effluent TOC (mg/L)			8.7	6.8	6.8								7.9	7
Raw BDOC (ug C/L)			0	NA	NA								NA	
Ozone Effluent BDOC (mg C/L)			1060	415	NA								NA	
Raw Calcium (mg/L)					52								39	
Raw HPC (CFU/mL)					2466								NA	
Raw Chloride (mg/L)					50								50	
Raw Effluen Alkalinity, Total (mg/L)					81								70	
Ozone Effluen Alkalinity, Total (mg/L)													90	
Ozone Effluent HPC (CFU/mL)					152								NA	
Tank Water HPC (CFU/mL)					5700								NA	
GAC #1 HPC (CFU/mL)					5700								NA	
GAC #1 TOC (mg/L)					4.4								7.2	
GAC #1 DOC (mg/L)													8.6	
GAC #2 HPC (CFU/mL)					5700								NA	
GAC #2 TOC (mg/L)					2.8								4.6	
GAC #2 DOC (mg/L)													4.5	
GAC #3 HPC (CFU/mL)					5700								NA	
GAC #3 TOC (mg/L)					1.6								3.9	
GAC #3 DOC (mg/L)													4.2	
GAC #4 HPC (CFU/mL)					5700								NA	
GAC #4 TOC (mg/L)					0.58								3	
GAC #4 DOC (mg/L)													4	
Raw BDOC (ug C/L)													1140	
GAC #1 BDOC (ug/L)													79	
GAC #2 BDOC (ug/L)													53	

Table B-5. AOP Testing - Peroxide

	Peroxide	
Date	31-Mar	31-Mar
Power	0%	0%
Peroxide Dose (ppm)	5	10
Flow (gpm)	13	13
Color (Influent)	46	43
Color (Effluent)	36	23
% Color Removal	22%	47%

Table B-6. AOP Testing - Ozone + UV

	Ozone + UV	
Date	19-Feb	19-Feb
Flow (gpm)	16	16
Gas Flow (lpm)	3	3
UV (mW/cm^2)	0.3	0
UV (mJ/cm^2)	12.6	0.0
Ozone Concentration (g/Nm3)	43	43
Backpressure (psi)	24	24
Ozone Residual (mg/L)	0.00	0.00
Color (Influent)	13.2	
Color (Effluent)	0	0.5
UV254 UVT (Influent)	65.59	
UV254 UVT (Effluent)	73.81	77.01
UV254 UVA (Influent)	0.183	
UV254 UVA (Effluent)	0.132	0.113
pH (Influent)	10.1	
pH (Effluent)	10.1	
Sulfide (Influent) ug/L	0	
DO (Influent)	0	
DO (Effluent)	5.2	
		Turned UV off same settings as other test

Figure B-1

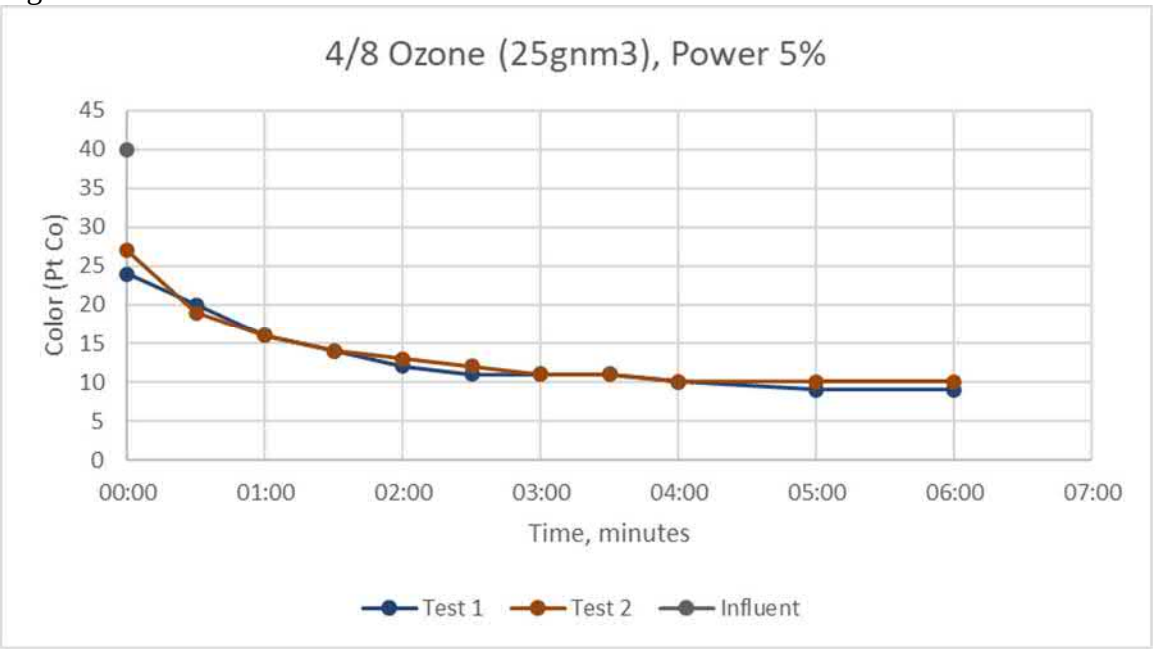


Figure B-2

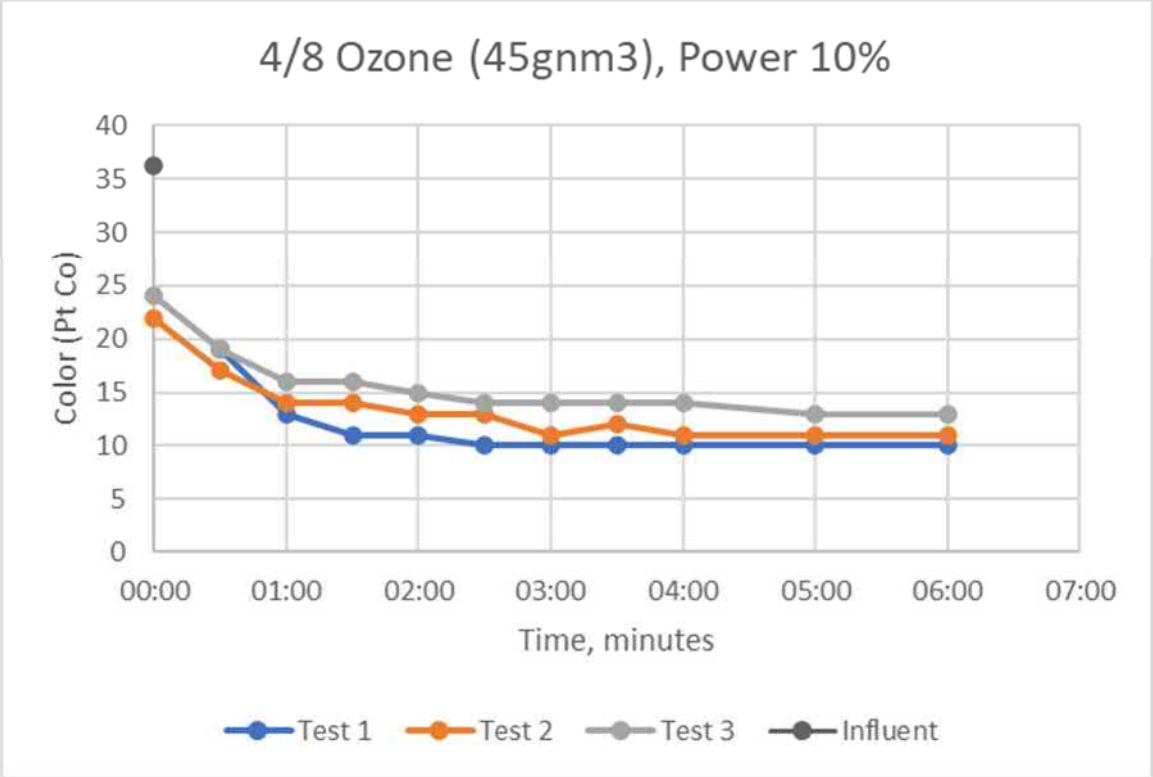


Figure B-3

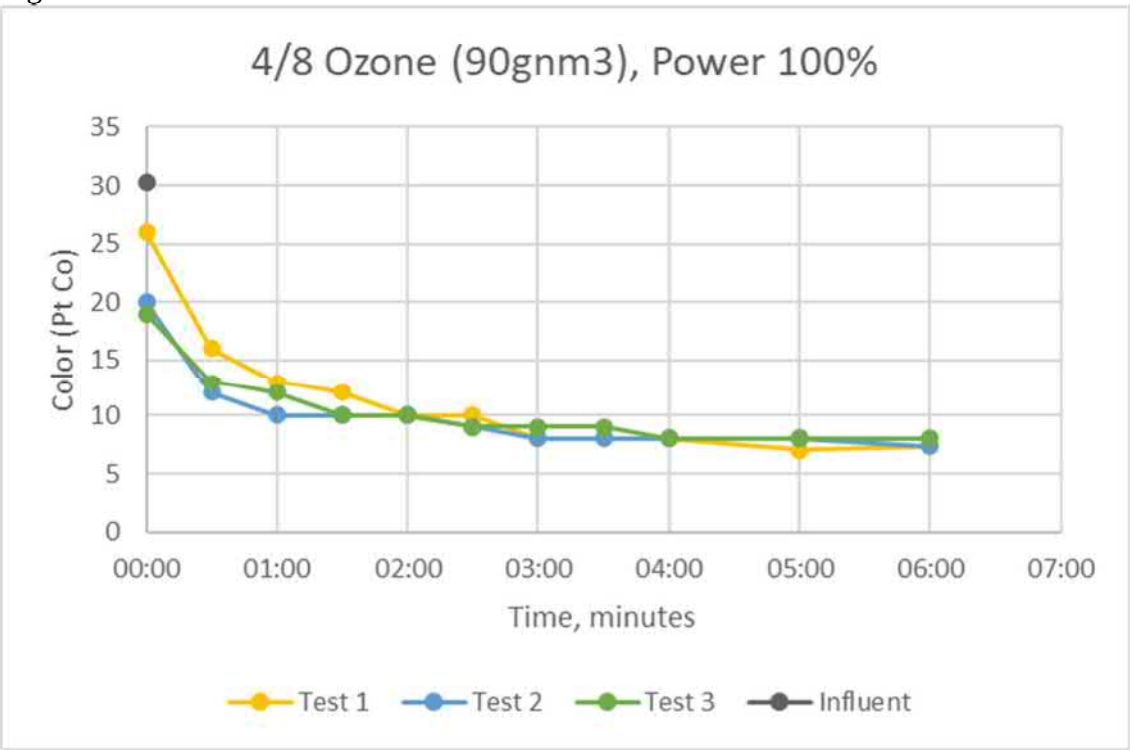


Figure B-4

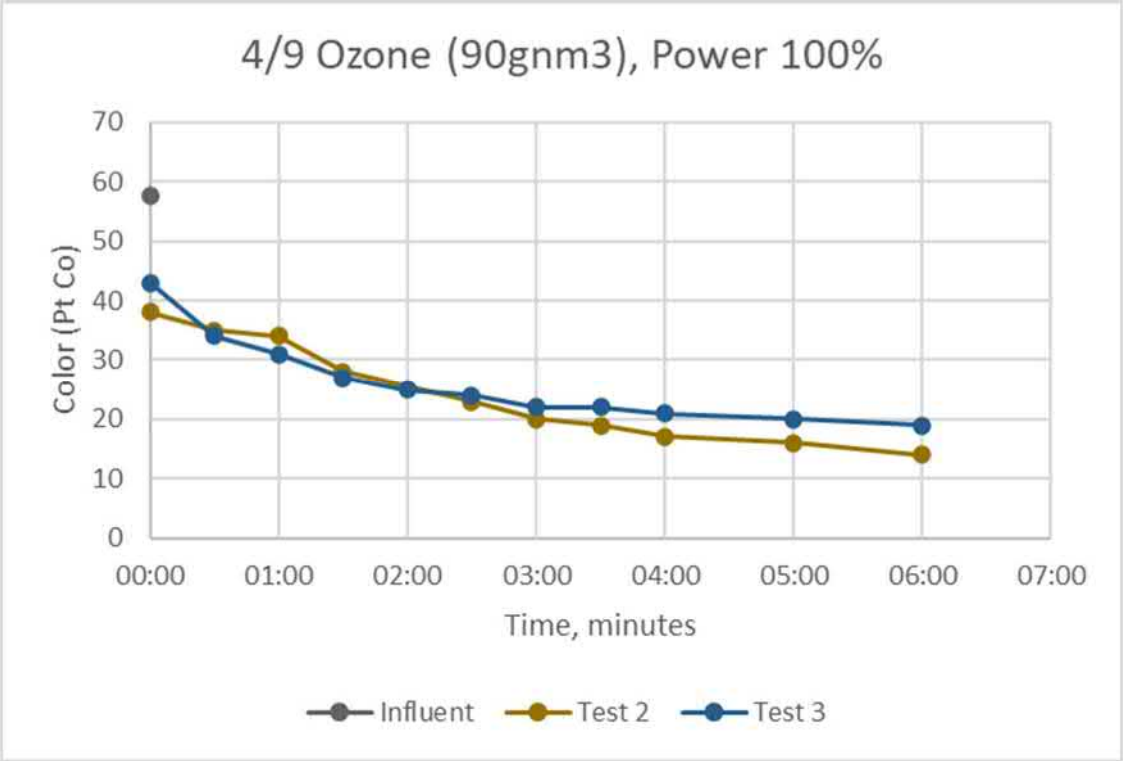
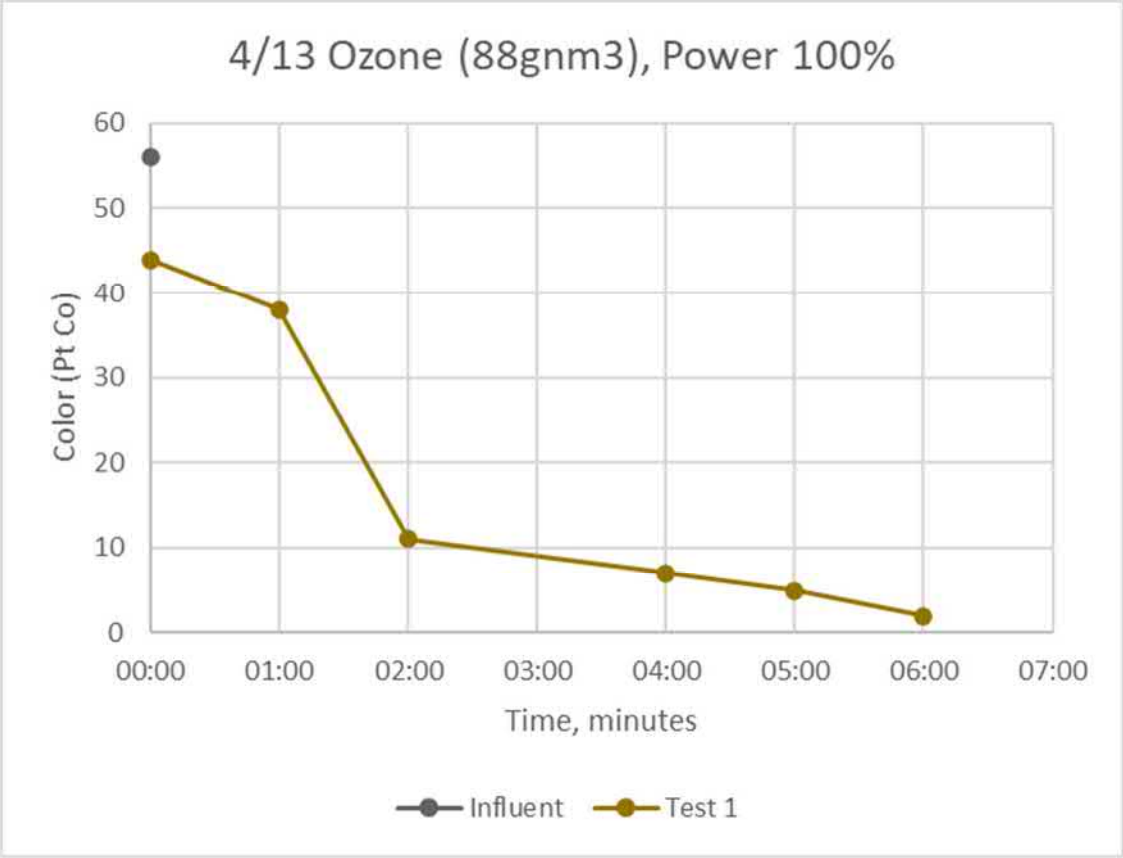


Figure B-5


4/13 Ozone (88gnm3), Power 100%
Color (Pt Co)
60
50
40
30
20
10
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
Time, minutes
Influent
Test 1

Attachment C – BAC Pilot Results

Table C-1. BAC Testing Results

Feed Water

Date	Time		Meter Reading (gal)	Totalized Flow (gpm)	Flow (gpm)	pH	UV 254 UVT	UV 254 UVA	Turbidity (NTU)	Total Sulfide (ug/L)	DO (mg/L)	Color
2/18/21	4:00 PM	2/18/21 4:00 PM	297	-	0.25	NA	NA	NA	NA	NA	NA	
2/19/21	4:00 PM	2/19/21 4:00 PM	668	0.26	0.25	10.0	61.33	0.212	NA	NA	NA	52
3/3/21	6:30 AM	3/3/21 6:30 AM	1520	0.05	0.10	9.7	63.21	0.199	2.5	NA	NA	39
3/8/21	10:50 AM	3/8/21 10:50 AM	2265	0.10	0.10	9.6	NA	NA	56.5	NA	NA	28
3/9/21	9:00 AM	3/9/21 9:00 AM	2587	0.24	0.30	9.4	74.71	0.127	3.6	NA	NA	34
3/21/2021	10:00 AM	3/21/21 10:00 AM	3863	0.07	0.3			NA				71
3/22/2021	7:00 PM	3/22/21 7:00 PM	3900	0.02	0.3							23
3/30/2021	5:00 PM	3/30/21 5:00 PM	4000	0.01	0.3			NA				40
3/31/2021	5:04 PM	3/31/21 5:04 PM	4472	0.33	0.3			NA				48
4/8/2021	4:00 PM	4/8/21 4:00 PM	4508	0.00	0.3		63.37	0.198				30
4/9/2021	8:30 AM	4/9/21 8:30 AM	4745	0.24	0.3	10	64.53	0.190				25
4/9/2021	4:20 PM	4/9/21 4:20 PM	4849	0.22	0.3	9.5	67.49	0.171				28
4/10/2021	2:30 PM	4/10/21 2:30 PM	5123	0.21	0.3	9.57						39
4/11/2021	9:45 AM	4/11/21 9:45 AM	5296	0.15	0.3	9.97						25
4/12/2021	9:55 AM	4/12/21 9:55 AM	5388	0.06	0.3	9.77						28
4/13/2021	5:00 PM	4/13/21 5:00 PM	5551	0.09	0.3			NA				37
4/14/2021	9:40 AM	4/14/21 9:40 AM	5554	0.00	0.3	9.55						25
4/15/2021	1:10 PM	4/15/21 1:10 PM	5576	0.01	0.3	9.65						44
4/18/2021	9:55 AM	4/18/21 9:55 AM	6006	0.10	0.3	9.77						44
4/19/2021	1:40 PM	4/19/21 1:40 PM	6411	0.24	0.3	9.78						46
4/21/2021	12:09 PM	4/21/21 12:09 PM	6775	0.13	0.3	10.07						26
4/23/2021	7:00 PM	4/23/21 7:00 PM	7110	0.10	0.3	9.98						32
4/24/2021	1:00 PM	4/24/21 1:00 PM	7466	0.33	0.3	9.91						30
4/30/2021	10:00 AM	4/30/21 10:00 AM	8152	0.08	0.3							
4/30/2021	2:00 PM	4/30/21 2:00 PM	8200	0.20	0.3							

GAC 1 Effluent

Date	Time	Flow (gpm)	Bed Volumes	Pressure (psi)	pH	UV 254 UVT	UV 254 UVA	Turbidity (NTU)	Total Sulfide (ug/L)	DO (mg/L)		Color
2/18/21	4:00 PM	0.25	-	NA	NA	NA		NA	NA	NA		
2/19/21	4:00 PM	0.25	171	6	9.7	93.43	0.030	NA	NA	NA	98%	1
3/3/21	6:30 AM	0.1	562	12	9.3	83.04	0.081	0.11	NA	NA	82%	7
3/8/21	10:50 AM	0.1	905	24	9.56	NA		2.93	NA	NA	39%	17
3/9/21	9:00 AM	0.0	1,052	17	9.7	81.42	0.089	0.32	NA	NA	59%	14
3/21/2021	10:00 AM		1,639								68%	23
3/22/2021	7:00 PM		1,656								30%	16
3/30/2021	5:00 PM		1,702								0%	40
3/31/2021	5:04 PM		1,919								33%	32
4/8/2021	4:00 PM		1,935			77.61	0.110				77%	7
4/9/2021	8:30 AM		2,044	12	9.6	74.14	0.130				36%	16
4/9/2021	4:20 PM		2,092	12	9.4	75.42	0.123				71%	8
4/10/2021	2:30 PM		2,218		9.2						-33%	52
4/11/2021	9:45 AM		2,298		9.67						100%	
4/12/2021	9:55 AM		2,340		9.77						-21%	34
4/13/2021	5:00 PM		2,415	17							0%	37
4/14/2021	9:40 AM		2,416		9.36						-8%	27
4/15/2021	1:10 PM		2,426		9.4						-7%	47
4/18/2021	9:55 AM		2,624		9.47						41%	26
4/19/2021	1:40 PM		2,810		9.51						0%	46
4/21/2021	12:09 PM		2,977		8.83						0%	26
4/23/2021	7:00 PM		3,131		8.58						0%	32
4/24/2021	1:00 PM		3,295		9.9						0%	30
4/30/2021	10:00 AM		3,610			42.53	0.371					
4/30/2021	2:00 PM		3,632			55.35	0.257					39

GAC 2 Effluent

Date	Time	Flow (gpm)	Bed Volumes	Pressure (psi)	pH	UV 254 UVT	UV 254 UVA	Turbidity (NTU)	Total Sulfide (ug/L)	DO (mg/L)		Color
2/18/21	4:00 PM	0.25	-	NA	NA	NA	NA	NA	NA	NA		
2/19/21	4:00 PM	0.25	85	2	9.6	99.55	0.0020	NA	NA	NA		0
3/3/21	6:30 AM	0.1	281	1	8.8	96.22	0.0167	0.49	NA	NA		0
3/8/21	10:50 AM	0.1	452	0	9.47	NA	NA	0.097	NA	NA	82%	3
3/9/21	9:00 AM	0	526	1	9.6	89.44	0.0485	0.39	NA	NA	43%	8
3/21/2021	10:00 AM		819								52%	11
3/22/2021	7:00 PM		828								31%	11
3/30/2021	5:00 PM		851								63%	15
3/31/2021	5:04 PM		959								56%	14
4/8/2021	4:00 PM		968			91.42	0.0390				86%	1
4/9/2021	8:30 AM		1,022	3	9.2	80.7	0.0931				50%	8
4/9/2021	4:20 PM		1,046	3	9.1	81.7	0.0878				63%	3
4/10/2021	2:30 PM		1,109		9.3						81%	10
4/11/2021	9:45 AM		1,149		9.5						######	12
4/12/2021	9:55 AM		1,170		9.63						71%	10
4/13/2021	5:00 PM		1,207	4							95%	2
4/14/2021	9:40 AM		1,208		9.22						78%	6
4/15/2021	1:10 PM		1,213		9.22						87%	6
4/18/2021	9:55 AM		1,312		9.23						58%	11
4/19/2021	1:40 PM		1,405		9.29						85%	7
4/21/2021	12:09 PM		1,489		8.87						58%	11
4/23/2021	7:00 PM		1,566		8.52						75%	8
4/24/2021	1:00 PM		1,647		9.65						83%	5
4/30/2021	10:00 AM		1,805			80.51	0.0942				######	14
4/30/2021	2:00 PM		1,816			88.51	0.0530				69%	12

GAC 3 Effluent

Date	Time	Flow (gpm)	Bed Volumes	Pressure (psi)	pH	UV 254 UVT	UV 254 UVA	Turbidity (NTU)	Total Sulfide (ug/L)	DO (mg/L)	Color
2/18/21	4:00 PM	0.25	-	NA	NA	NA	NA	NA	NA	NA	
2/19/21	4:00 PM	0.25	57	1	9.6	99.94	0.000260655	NA	NA	NA	0
3/3/21	6:30 AM	0.1	187	0	8.8	100	0	0.43	NA	NA	0
3/8/21	10:50 AM	NA	302	NA	NA	NA	NA	NA	NA	NA	NA
3/9/21	9:00 AM	0	351	0	9.6	94.35	0.025258095	0.72	NA	NA	0
3/21/2021	10:00 AM		546				#NUM!				7
3/22/2021	7:00 PM		552								0
3/30/2021	5:00 PM		567				#NUM!				8
3/31/2021	5:04 PM		640				#NUM!				12
4/8/2021	4:00 PM		645			98.9	0.004803708				0
4/9/2021	8:30 AM		681	2	8.8		#NUM!				7
4/9/2021	4:20 PM		697	2	8.6	91.39	0.039101323				0
4/10/2021	2:30 PM		739								
4/11/2021	9:45 AM		766								
4/12/2021	9:55 AM		780								
4/13/2021	5:00 PM		805	3			#NUM!				0
4/14/2021	9:40 AM		805								
4/15/2021	1:10 PM		809								
4/18/2021	9:55 AM		875								
4/19/2021	1:40 PM		937								
4/21/2021	12:09 PM		992								
4/23/2021	7:00 PM		1,044								
4/24/2021	1:00 PM		1,098								
4/30/2021	10:00 AM		1,203			83.45	0.078573659				14
4/30/2021	2:00 PM		1,211			74.45	0.128135298				8

GAC 4 Effluent

Date	Time	Flow (gpm)	Bed Volumes	Pressure (psi)	pH	UV 254 UVT	UV 254 UVA	Turbidity (NTU)	Total Sulfide (ug/L)	DO (mg/L)	Color
2/18/21	4:00 PM	0.25	-	NA	NA	NA	NA	NA	NA	NA	NA
2/19/21	4:00 PM	0.25	43	0	9.4	100	0	NA	NA	NA	0
3/3/21	6:30 AM	0.25	141	0	8.7	100	0	0.32	NA	NA	0
3/8/21	10:50 AM	NA	226	NA	NA	NA	NA	NA	NA	NA	NA
3/9/21	9:00 AM	0.1	263	0	9.6	99.35	0.002832129	0.43	NA	NA	0
3/21/2021	10:00 AM		410				#NUM!				13
3/22/2021	7:00 PM		414								0
3/30/2021	5:00 PM		425				#NUM!				9
3/31/2021	5:04 PM		480				#NUM!				15
4/8/2021	4:00 PM		484			99.96	0.000173753				0
4/9/2021	8:30 AM		511	1	8.6	98.38	0.007093182				5
4/9/2021	4:20 PM		523	1	8.3		#NUM!				0
4/10/2021	2:30 PM		555								
4/11/2021	9:45 AM		574								
4/12/2021	9:55 AM		585								
4/13/2021	5:00 PM		604	3			#NUM!				0
4/14/2021	9:40 AM		604								
4/15/2021	1:10 PM		607								
4/18/2021	9:55 AM		656								
4/19/2021	1:40 PM		703								
4/21/2021	12:09 PM		744								
4/23/2021	7:00 PM		783								
4/24/2021	1:00 PM		824								
4/30/2021	10:00 AM		903			88.61	0.052517263				12
4/30/2021	2:00 PM		908			71.54	0.145451064				0

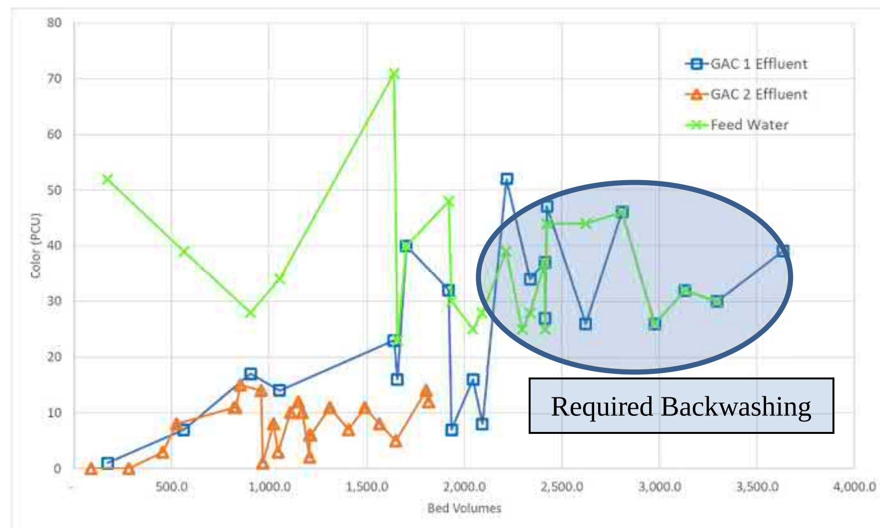
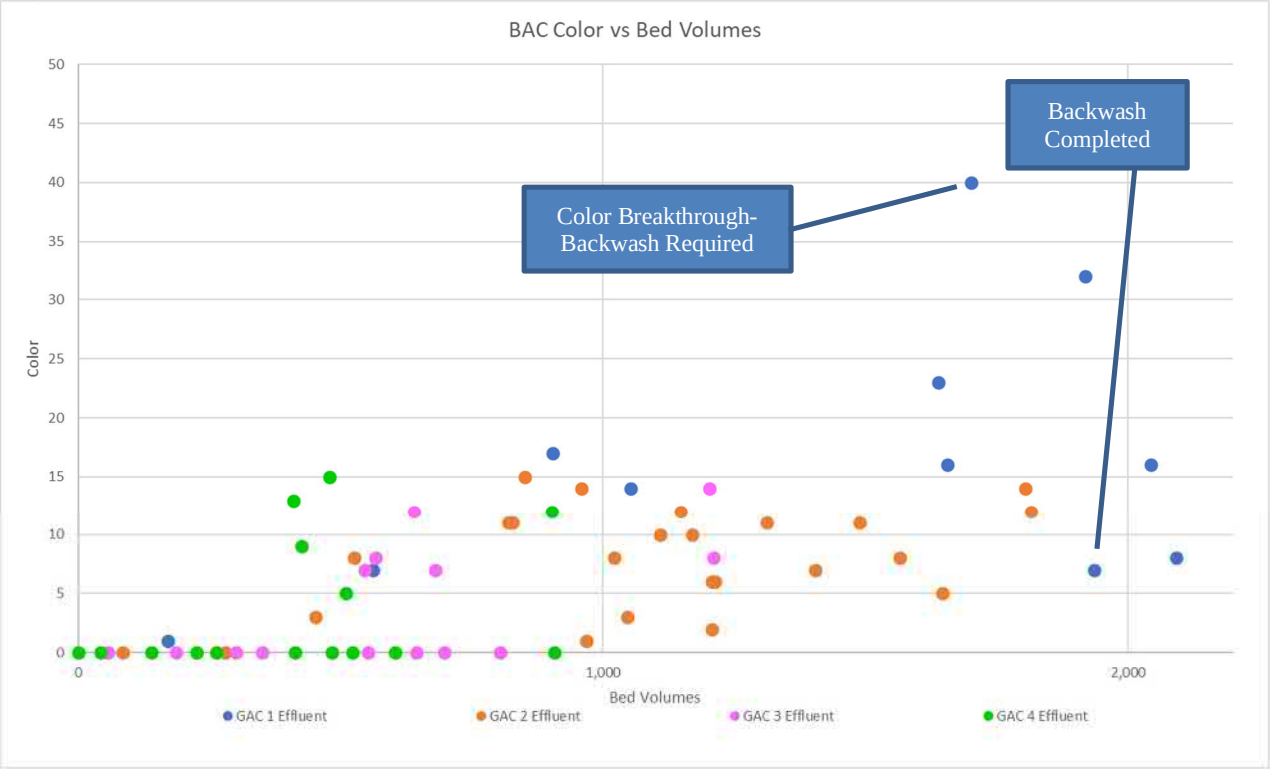


Figure C-1. BAC Color vs. Bed Volumes



Attachment D – Raw Laboratory Analyses

Advanced Environmental Laboratories, Inc.

Advanced Environmental Laboratories, Inc
10200 USA Today Way Miramar, FL 33025
Payments: P.O. Box 551580 Jacksonville, FL 32255-1580
Phone: (954)889-2288
Fax: (954)889-2281

March 8, 2021

Christophe M. Robert
Reiss Engineering, Inc.
1016 Spring Villas Pt.
Winter Springs, FL 32708

RE: Workorder: M2100882 City of Ft Lauderdale Fiveash

Dear Christophe Robert:

Enclosed are the analytical results for sample(s) received by the laboratory on Monday, February 22, 2021. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report. The analytical results for the samples contained in this report were submitted for analysis as outlined by the Chain of Custody and results pertain only to these samples.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Deb Griffith - Client Services Manager
DGriffith@aellab.com

Enclosures

CERTIFICATE OF ANALYSIS

NELAP Accredited E82535

Advanced Environmental Laboratories, Inc.

Advanced Environmental Laboratories, Inc
10200 USA Today Way Miramar, FL 33025
Payments: P.O. Box 551580 Jacksonville, FL 32255-1580
Phone: (954)889-2288
Fax: (954)889-2281

SAMPLE SUMMARY

Workorder: M2100882 City of Ft Lauderdale Fiveash

Lab ID	Sample ID	Matrix	Date Collected	Date Received
M2100882001	Ozone In	Drinking Water	2/18/2021 10:00	2/22/2021 17:30
M2100882002	Ozone Eff	Drinking Water	2/18/2021 09:30	2/22/2021 17:30
M2100882003	Ozone + Per In	Drinking Water	2/19/2021 10:05	2/22/2021 17:30
M2100882004	Ozone + Per Eff	Drinking Water	2/19/2021 10:00	2/22/2021 17:30
M2100882005	Ozone Low Eff	Drinking Water	2/19/2021 13:00	2/22/2021 17:30

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ANALYTICAL RESULTS

Workorder: M2100882 City of Ft Lauderdale Fiveash

Lab ID: **M2100882001** Date Received: 02/22/21 17:30 Matrix: Drinking Water
Sample ID: **Ozone In** Date Collected: 02/18/21 10:00

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: IC,E300.0,Water	Analytical Method: EPA 300.0							
Bromide	**0.20**	**U**	**mg/L**	**2**	1.0	0.20	3/3/2021 18:25	T
Analysis Desc: IC,E300.1,Water	Analytical Method: EPA 300.1							
Bromate	**3.7**	**U**	**ug/L**	**1**	10	3.7	2/24/2021 22:56	T
Analysis Desc: DOC,SM5310B,Water	Analytical Method: SM 5310B							
Dissolved Organic Carbon	**7.8**		**mg/L**	**1**	1.0	0.50	2/24/2021 18:26	T
Total Organic Carbon	**7.9**		**mg/L**	**1**	1.0	0.50	3/2/2021 15:30	T

Lab ID: **M2100882002** Date Received: 02/22/21 17:30 Matrix: Drinking Water
Sample ID: **Ozone Eff** Date Collected: 02/18/21 09:30

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: IC,E300.0,Water	Analytical Method: EPA 300.0							
Bromide	**0.20**	**U**	**mg/L**	**2**	1.0	0.20	3/3/2021 18:41	T
Analysis Desc: IC,E300.1,Water	Analytical Method: EPA 300.1							
Bromate	**3.7**	**U**	**ug/L**	**1**	10	3.7	2/24/2021 23:35	T
Analysis Desc: DOC,SM5310B,Water	Analytical Method: SM 5310B							
Dissolved Organic Carbon	**7.6**		**mg/L**	**1**	1.0	0.50	2/24/2021 18:45	T
Total Organic Carbon	**8.7**		**mg/L**	**1**	1.0	0.50	3/2/2021 15:51	T

CERTIFICATE OF ANALYSIS

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ANALYTICAL RESULTS

Workorder: M2100882 City of Ft Lauderdale Fiveash

Lab ID: **M2100882003** Date Received: 02/22/21 17:30 Matrix: Drinking Water
Sample ID: **Ozone + Per In** Date Collected: 02/19/21 10:05

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: IC,E300.0,Water	Analytical Method: EPA 300.0							
Bromide	**0.20**	**U**	**mg/L**	**2**	1.0	0.20	3/3/2021 18:57	T
Analysis Desc: IC,E300.1,Water	Analytical Method: EPA 300.1							
Bromate	**3.7**	**U**	**ug/L**	**1**	10	3.7	2/25/2021 00:14	T
Analysis Desc: DOC,SM5310B,Water	Analytical Method: SM 5310B							
Dissolved Organic Carbon	**6.6**		**mg/L**	**1**	1.0	0.50	2/24/2021 18:58	T
Total Organic Carbon	**6.9**		**mg/L**	**1**	1.0	0.50	3/2/2021 16:12	T

Lab ID: **M2100882004** Date Received: 02/22/21 17:30 Matrix: Drinking Water
Sample ID: **Ozone + Per Eff** Date Collected: 02/19/21 10:00

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: IC,E300.0,Water	Analytical Method: EPA 300.0							
Bromide	**0.20**	**U**	**mg/L**	**2**	1.0	0.20	3/3/2021 19:13	T
Analysis Desc: IC,E300.1,Water	Analytical Method: EPA 300.1							
Bromate	**3.7**	**U**	**ug/L**	**1**	10	3.7	2/25/2021 00:53	T
Analysis Desc: DOC,SM5310B,Water	Analytical Method: SM 5310B							
Dissolved Organic Carbon	**6.6**		**mg/L**	**1**	1.0	0.50	2/24/2021 19:12	T
Total Organic Carbon	**6.9**		**mg/L**	**1**	1.0	0.50	3/2/2021 16:32	T

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ANALYTICAL RESULTS

Workorder: M2100882 City of Ft Lauderdale Fiveash

Lab ID: **M2100882005** Date Received: 02/22/21 17:30 Matrix: Drinking Water

Sample ID: **Ozone Low Eff** Date Collected: 02/19/21 13:00

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: IC,E300.0,Water	Analytical Method: EPA 300.0							
Bromide	**0.20**	**U**	**mg/L**	**2**	1.0	0.20	3/3/2021 20:01	T
Analysis Desc: IC,E300.1,Water	Analytical Method: EPA 300.1							
Bromate	**3.7**	**U**	**ug/L**	**1**	10	3.7	2/25/2021 01:32	T
Analysis Desc: DOC,SM5310B,Water	Analytical Method: SM 5310B							
Dissolved Organic Carbon	**6.6**		**mg/L**	**1**	1.0	0.50	2/24/2021 19:25	T
Total Organic Carbon	**6.8**		**mg/L**	**1**	1.0	0.50	3/2/2021 16:45	T

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ANALYTICAL RESULTS QUALIFIERS

Workorder: M2100882 City of Ft Lauderdale Fiveash

PARAMETER QUALIFIERS

U	The compound was analyzed for but not detected.
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

LAB QUALIFIERS

T	DOH Certification #E84589(AEL-T)(FL NELAC Certification)

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QUALITY CONTROL DATA

Workorder: M2100882 City of Ft Lauderdale Fiveash

QC Batch: WCAt/2143 Analysis Method: SM 5310B
QC Batch Method: SM 5310B Prepared:
Associated Lab Samples: M2100882001, M2100882002, M2100882003, M2100882004, M2100882005

METHOD BLANK: 3795992

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Dissolved Organic Carbon	mg/L	0.50	0.50	U

QC Batch: WCAt/2200 Analysis Method: EPA 300.1
QC Batch Method: EPA 300.1 Prepared:
Associated Lab Samples: M2100882001, M2100882002, M2100882003, M2100882004, M2100882005

METHOD BLANK: 3798858

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Bromate	ug/L	3.7	3.7	U

QC Batch: WCAt/2297 Analysis Method: SM 5310B
QC Batch Method: SM 5310B Prepared:
Associated Lab Samples: M2100882001, M2100882002, M2100882003, M2100882004, M2100882005

METHOD BLANK: 3803646

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Total Organic Carbon	mg/L	0.50	0.50	U

QC Batch: WCAt/2340 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Prepared:
Associated Lab Samples: M2100882001, M2100882002, M2100882003, M2100882004, M2100882005

METHOD BLANK: 3805513

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				

CERTIFICATE OF ANALYSIS

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QUALITY CONTROL DATA

Workorder: M2100882 City of Ft Lauderdale Fiveash

METHOD BLANK: 3805513

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
Bromide	mg/L	0.10	0.10	U

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: M2100882 City of Ft Lauderdale Fiveash

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
M2100882001	Ozone In			SM 5310B	WCAt/2143
M2100882002	Ozone Eff			SM 5310B	WCAt/2143
M2100882003	Ozone + Per In			SM 5310B	WCAt/2143
M2100882004	Ozone + Per Eff			SM 5310B	WCAt/2143
M2100882005	Ozone Low Eff			SM 5310B	WCAt/2143
M2100882001	Ozone In			EPA 300.1	WCAt/2200
M2100882002	Ozone Eff			EPA 300.1	WCAt/2200
M2100882003	Ozone + Per In			EPA 300.1	WCAt/2200
M2100882004	Ozone + Per Eff			EPA 300.1	WCAt/2200
M2100882005	Ozone Low Eff			EPA 300.1	WCAt/2200
M2100882001	Ozone In			SM 5310B	WCAt/2297
M2100882002	Ozone Eff			SM 5310B	WCAt/2297
M2100882003	Ozone + Per In			SM 5310B	WCAt/2297
M2100882004	Ozone + Per Eff			SM 5310B	WCAt/2297
M2100882005	Ozone Low Eff			SM 5310B	WCAt/2297
M2100882001	Ozone In			EPA 300.0	WCAt/2340
M2100882002	Ozone Eff			EPA 300.0	WCAt/2340
M2100882003	Ozone + Per In			EPA 300.0	WCAt/2340
M2100882004	Ozone + Per Eff			EPA 300.0	WCAt/2340
M2100882005	Ozone Low Eff			EPA 300.0	WCAt/2340

Advanced Environmental Laboratories, Inc.

☐ Altamo
☐ Fort My
☐ Jackson
☐ Tallahas

M2100882

076

Page 1 of 1

☐ Gainesville: 4965 SW 41st Blvd., FL 32608 • 352.377.2349 • Lab ID: E82001
☑ Miramar: 10200 USA Today Way, FL 33025 • 954.889.2288 • Lab ID: E82535
☐ Tampa: 9610 Princess Palm Ave., FL 33619 • 813.630.9616 • Lab ID: E84589

Client Name:	Reiss Engineering, Inc.	Project Name:	City of Ft. Lauderdale Fiveash
Address:	1016 Spring Villas Pt.	Project Number:	
	Winter Springs, FL 32708	PO Number:	
Phone:	407-679-5358	FDEP Facility No:	
FAX:		FDEP Facility Addr:	
Contact:	Christophe M. Robert		
Sampled By:	Jonathan McCarthy	Special Instructions:	
Turn Around Time:	Standard Rush		
AEL Profile #:		ADaPT EQuIS Other	

SAMPLE ID	SAMPLE DESCRIPTION	Grab Comp	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. COUNT	Preservation	Field-Filtered?	Bromate by 300.1	Bromide by 300.0	TOC by SM5310B	DOC by SM5310B	LABORATORY I.D. NUMBER
							BOTTLE SIZE & TYPE						
							ANALYSIS REQUIRED						
								NaThio					
	Ozone In		2/18	1000	DW				1	1	1	1	001
	Ozone Eff		2/18	930					1	1	1	1	002
	Ozone + Per In		2/19	10:05					1	1	1	1	003
	Ozone + Per Eff		2/19	1000					1	1	1	1	004
	Ozone Low Eff		2/19	1300					1	1	1	1	005

Matrix Code: WW = wastewater SW = surface water GW = ground water DW = drinking water O = oil A = air SO = soil SL = sludge

Preservation Code: I = ice H=(HCl) S = (H2SO4) N = (HNO3) T = (Sodium Thiosulfate)

Received on Ice ☑ Yes ☐ No ☑ Temp taken from sample ☐ Temp from blank ☐ Where required, pH checked

Temp. when received (observed) 4.1 °C Temp. when received (corrected) 3.9 °C

DCN: AD-D051web Form last revised 08/07/2019

Device used for measuring Temp by unique identifier (circle IR temp gun used) J: 9A G: LT-1 LT-2 T: 10A A: 3A M: 3A S: 1V F: 1A

	Relinquished by:	Date	Time	Received by:	Date	Time
1	[illegible]	2/22/21	1450	[illegible]	2/22/21	1450
2	[illegible]	2/22/21	1730	[illegible]	2/22/21	1730
3				Courier		
4				Site-Address		

FOR DRINKING WATER USE:

(When PWS Information not otherwise supplied) PWS ID:

Contact Person:

Supplier of Water:

Site-Address:

NELAP Accredited E82535

March 26, 2021

Client: Calgon Carbon Corporation

3000 GSK Drive

Moon Township, PA 15108

Requested By: -

National Environmental Laboratory Accreditation Program
ODEQ TNI Certified

Sample Project Name:	THM HAA Potentials Plus Add.
Date Samples Received:	February 24, 2021 Time: 10:00 sample temp upon arrival at lab = 10.00°C - On Ice
Matrix:	Water
Lab Log Numbers:	**DB24036-01 DB24036-02 DB24036-03 DB24036-04**
Work Order:	DB24036
Report #	DB24036-0326210810
EPA Lab ID#'s:	**Stillwater OK00092 Tulsa OK00983 OKC OK00129 ICR OK 001**
Oklahoma Certification:	Stillwater NELAP WasteWater, ODEQ 8316/ Drinking Water, DEQ D9602 NELAP Tulsa WasteWater, ODEQ 9905 / Drinking Water, DEQ D9901 Oklahoma City NELAP WasteWater ODEQ 7202 / Drinking Water, DEQ D9937
Kansas Certification:	Stillwater NELAP CERT # E-10219 Oklahoma City NELAP CERT # E-10414
Texas Certification:	Stillwater Drinking Water NELAP CERT # T105704533-14-1
Method Reference:	40 CFR 136, 141, and 261 Methods for Chemical Analysis of Water and Wastes EPA-600/4-79-020, March 1983. Test Methods for Evaluating Solid Wastes, SW-846, Final Update III. Standard Methods 1998 (20th Edition), Standard Methods 2005 (21st Edition) and Standard Methods 2011 (22nd Edition) for the Examination of Water and Wastewater.
Analysis Reference:	If qualifiers present in "Prep Info" or "Analysis Info", then analysis performed as follows: @= Tulsa Lab and * = OKC Lab. If no qualifiers present, then analysis performed at Stillwater Lab.

Accurate Environmental Laboratories certify that the test results performed at the Stillwater lab meet all requirements of NELAP. Any exceptions to this can be found in the report footer or Quality Control Section of the report.

This report is to only be replicated in its entirety.

Accurate Environmental sampling protocol was followed for any sampling performed by Accurate Field Services.

Sample: ***Ozone Low Eff*** **Location Code:** **PWSID#:**

Collection Type: Grab Sample Time: 2/18/21 13:00 **Lab Log#** DB24036-01

Method/Parameter	Test	Result	Notes	PQL#	Prep Info	Analysis Info
Biodegradable Dissolved Organic Carbon (No Cert.)	Biodegradable Dissolved Organic Carbon	415 ug C/L		25.0	02/25/21 19:00 OHB	03/25/21 12:20 OHB

Sample: ***Ozone In*** **Location Code:** **PWSID#:**

Collection Type: Grab Sample Time: 2/18/21 10:00 **Lab Log#** DB24036-02

Method/Parameter	Test	Result	Notes	PQL#	Prep Info	Analysis Info
Biodegradable Dissolved Organic Carbon (No Cert.)	Biodegradable Dissolved Organic Carbon	BPQL ug C/L	Z-04	25.0	02/25/21 19:00 OHB	03/25/21 12:20 OHB

Sample: ***Ozone Eff*** **Location Code:** **PWSID#:**

Collection Type: Grab Sample Time: 2/18/21 9:30 **Lab Log#** DB24036-03

Method/Parameter	Test	Result	Notes	PQL#	Prep Info	Analysis Info
Biodegradable Dissolved Organic Carbon (No Cert.)	Biodegradable Dissolved Organic Carbon	1060 ug C/L		25.0	02/25/21 19:00 OHB	03/25/21 12:20 OHB

Notes and Definitions

Z-04	The #2 sample showed no significant Carbon change from the beginning to the end. -OHB
MCL	Analyte concentration may exceed Maximum Contaminant Limit (MCL) for EPA Primary or Secondary Drinking Water Regulations.
###	Analyte concentration may exceed regulatory limit.
PQL	Practical Quantitation Limit - the method reporting limit (MRL) adjusted for any dilutions or other changes made to the sample to deal with interferences/matrix effects
BPQL	Below Practical Quantitation Limit (if applicable).

The "Prep Date" of the QC analysis coincides with the characters of the appropriate QC Lab ID. (Example: 19 A 02 15 - BLK = 2019, Jan 2, Batch #15 - Blank)

Lab Manager

* Complete Entire COC to be in Compliance*

RUSH Due Date ____________

Accurate Environmental Labs

Chain of Custody

Client Name- **Calgon Carbon Corporation**

Project Name- THM HAA Potentials Plus Add.

Sample Preserv. & Container → 2-1000 ml n/p Plastic; 2-1000 ml n/p Amber Glass

Accurate Work Order #	Date Sample Taken	Time Sample Taken	Matrix or Source (Refer below)	Grab (G) or Comp (C)	Client I.D. / Sample Location or DEQ / EPA Location Code	Field Results (pH, Temp, Chlorine, …) (note analysis & units) Location Code	Chlorine (mg/L)		Analysis Requested → / # of Container ↓	HAA Potential Day 1,3,5	**THM Potential Day 1,3,5	Total Chlorine, pH In Lab	TOC	UV254	BDOC	
DB240316			W	G					4	X	X	X	X	X		
-01	2/18	1300	W	G	* Ozone Low Eff										1	
-02	2/18	1000	W	G	Ozone In										1	
-03	2/18	930	W	G	Ozone Eff										1	
-04	2/19	100	W	G	* Ozone + Per Eff										1	

On-Site Info: Raw Alkalinity (TOC Raw) = __________ mg/L Turbidity (E-Coli) = __________ ntu

Field Instrument Calibration -				
Meter Type	Standards	Final Read.	Date , Time	Initials

Matrix Codes DW = Drinking Water WW = Wastewater SL = Sludge O = Other__________

E-Coli Source- GWUDI-FS= Groundwater under direct influence of Flowing Stream GWUDI-RL= Groundwater under direct influence of Reservoir/Lake

Comments *Please include chlorine result. ** NO Headspace (No air bubbles)*

*RECIEVE 1-1000ml N/P AMBER BROKE / OZONE + PER EFF | 1-1000 ml NP Amber Y2 Evil. – TKW 2-23-21 / OZONE LOW EFF

-- All Glass containers provided by Accurate Labs have Teflon lined lids --

-- All samples are scheduled to be disposed of in 4 weeks of receipt at Accurate. -

Certification by Company Official: I hereby certify that the above sampling occurred during a period such that the sample(s) is/are representative of a typical operating day discharge for the above facility. Signature: [signature] Date/Time 2/22 10:00

Sampled By: Jonathan McCarthy Company: RET Sample Method:

Relinquished By: Jonathan McCarthy	Date/Time 2/22 10:00	Received By:	Date/Time
☐ Relinquished to Lab By: ☐ Relq'd to Log-In Fridge By: UPS	Date/Time 2-23-21 / 1000	Received at Lab By: [signature] Rec'd °C ON ICE 10.0°C	Date/Time 2-23-21 / 1000

Reporting Requirements (standard 10-15 working days) | **Compliance Reporting?** Yes or No (DMR, PWS,) | Oklahoma **PWS ID #** | **RUSH** Request (if available) ______ (Working Days)

Mail Report To: Calgon Carbon Corporation

Address: *300 GSK Drive*
Moon Township, PA 15108

Phone #: *412-787-6606*

Email: *casey.theys@kuraray.com*

Mail Invoice To:

Bid # - THM HAA Potentials Plus 030620 DC

Address: *casey.theys@kuraray.com*

PO # - 051320 tkw

Phone #: ( ) Fax #: ( )

www.accuratelabs.com (800) 516-5227 | 505 South Lowry Street Stillwater, OK 74074 Phone: (405) 372-5300 Fax: (405) 372-5396 | 3910 East 51st Street Tulsa, OK 74135 Phone: (918) 663-5400 Fax: (918) 663-6300 | 12036 N. Pennsylvania Oklahoma City, OK 73120 Phone: (405) 751-3132 Fax: (405) 751-3108

Failure to complete this Chain of Custody form correctly may delay turnaround time of analytical reporting.

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April 9, 2021

Christophe M. Robert
Reiss Engineering, Inc.
1016 Spring Villas Pt.
Winter Springs, FL 32708

RE: Workorder: M2101302 City of Ft Lauderdale Fiveash

Dear Christophe Robert:

Enclosed are the analytical results for sample(s) received by the laboratory on Monday, March 22, 2021. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report. The analytical results for the samples contained in this report were submitted for analysis as outlined by the Chain of Custody and results pertain only to these samples.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Deb Griffith - Client Services Manager
DGriffith@aellab.com

Enclosures

CERTIFICATE OF ANALYSIS

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SAMPLE SUMMARY

Workorder: M2101302 City of Ft Lauderdale Fiveash

Lab ID	Sample ID	Matrix	Date Collected	Date Received
M2101302001	Raw Water	Water	3/22/2021 15:15	3/22/2021 17:35
M2101302002	AOP Effluent	Water	3/22/2021 16:00	3/22/2021 17:35
M2101302003	Tank Water	Water	3/22/2021 16:15	3/22/2021 17:35
M2101302004	Gac Effluent #1	Water	3/22/2021 16:15	3/22/2021 17:35
M2101302005	Gac Effluent #2	Water	3/22/2021 16:15	3/22/2021 17:35
M2101302006	Gac Effluent #3	Water	3/22/2021 16:15	3/22/2021 17:35
M2101302007	Gac Effluent #4	Water	3/22/2021 16:15	3/22/2021 17:35

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ANALYTICAL RESULTS

Workorder: M2101302 City of Ft Lauderdale Fiveash

Lab ID: **M2101302001** Date Received: 03/22/21 17:35 Matrix: Water
Sample ID: **Raw Water** Date Collected: 03/22/21 15:15

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
METALS								
Analysis Desc: E200.7 Analysis,Waters	Preparation Method: EPA 200.7 Analytical Method: EPA 200.7							
Calcium	**52**		**mg/L**	**1**	0.80	0.20	3/26/2021 17:13	M
Microbiology								
Analysis Desc: Heterotrophic Plate Count,9215B,DW	Analytical Method: SM 9215 B (Pour Plate)							
Heterotrophic Plate Count	**2466**	**V**	**CFU/1mL**	**1**	1.0	1.0	3/23/2021 12:10	M
WET CHEMISTRY								
Analysis Desc: IC,E300.0,Water	Analytical Method: EPA 300.0							
Bromide	**0.20**	**U**	**mg/L**	**2**	1.0	0.20	3/25/2021 18:55	T
Chloride	**50**		**mg/L**	**1**	5.0	0.50	3/23/2021 03:35	M
Analysis Desc: Alkalinity,SM2320B,Water	Analytical Method: SM 2320B							
Alkalinity, Total	**81**		**mg/L**	**1**	20	5.0	3/29/2021 18:02	T
Analysis Desc: DOC,SM5310B,Water	Analytical Method: SM 5310B							
Dissolved Organic Carbon	**6.7**		**mg/L**	**1**	1.0	0.50	3/26/2021 04:06	T
Total Organic Carbon	**6.7**		**mg/L**	**1**	1.0	0.50	3/25/2021 20:07	T

Lab ID: **M2101302002** Date Received: 03/22/21 17:35 Matrix: Water
Sample ID: **AOP Effluent** Date Collected: 03/22/21 16:00

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
Microbiology								
Analysis Desc: Heterotrophic Plate Count,9215B,DW	Analytical Method: SM 9215 B (Pour Plate)							
Heterotrophic Plate Count	**152**	**V,B**	**CFU/1mL**	**1**	1.0	1.0	3/23/2021 12:10	M
WET CHEMISTRY								
Analysis Desc: IC,E300.0,Water	Analytical Method: EPA 300.0							

CERTIFICATE OF ANALYSIS

NELAP Accredited E82535

Advanced Environmental Laboratories, Inc.

Advanced Environmental Laboratories, Inc
10200 USA Today Way Miramar, FL 33025
Payments: P.O. Box 551580 Jacksonville, FL 32255-1580
Phone: (954)889-2288
Fax: (954)889-2281

ANALYTICAL RESULTS

Workorder: M2101302 City of Ft Lauderdale Fiveash

Lab ID: **M2101302002** Date Received: 03/22/21 17:35 Matrix: Water
Sample ID: **AOP Effluent** Date Collected: 03/22/21 16:00

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
Bromide	**0.20**	**U**	**mg/L**	**2**	1.0	0.20	3/29/2021 15:35	T
Analysis Desc: IC,E300.1,Water	Analytical Method: EPA 300.1							
Bromate	**3.8**	**U**	**ug/L**	**1**	10	3.8	4/7/2021 19:58	T
Analysis Desc: DOC,SM5310B,Water	Analytical Method: SM 5310B							
Dissolved Organic Carbon	**6.9**		**mg/L**	**1**	1.0	0.50	3/26/2021 04:24	T
Total Organic Carbon	**6.8**		**mg/L**	**1**	1.0	0.50	3/25/2021 20:26	T

Lab ID: **M2101302003** Date Received: 03/22/21 17:35 Matrix: Water
Sample ID: **Tank Water** Date Collected: 03/22/21 16:15

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
Microbiology								
Analysis Desc: Heterotrophic Plate Count,9215B,DW	Analytical Method: SM 9215 B (Pour Plate)							
Heterotrophic Plate Count	**5700**	**>,V,Z**	**CFU/1mL**	**1**	1.0	1.0	3/23/2021 12:10	M

Lab ID: **M2101302004** Date Received: 03/22/21 17:35 Matrix: Water
Sample ID: **Gac Effluent #1** Date Collected: 03/22/21 16:15

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
Microbiology								
Analysis Desc: Heterotrophic Plate Count,9215B,DW	Analytical Method: SM 9215 B (Pour Plate)							
Heterotrophic Plate Count	**5700**	**>,V,Z**	**CFU/1mL**	**1**	1.0	1.0	3/23/2021 12:10	M
WET CHEMISTRY								
Analysis Desc: TOC,SM5310B,Water	Analytical Method: SM 5310B							
Total Organic Carbon	**4.4**		**mg/L**	**1**	1.0	0.50	3/25/2021 20:40	T

CERTIFICATE OF ANALYSIS

NELAP Accredited E82535

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Phone: (954)889-2288
Fax: (954)889-2281

ANALYTICAL RESULTS

Workorder: M2101302 City of Ft Lauderdale Fiveash

Lab ID: **M2101302005** Date Received: 03/22/21 17:35 Matrix: Water
Sample ID: **Gac Effluent #2** Date Collected: 03/22/21 16:15

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
Microbiology								
Analysis Desc: Heterotrophic Plate Count,9215B,DW	Analytical Method: SM 9215 B (Pour Plate)							
Heterotrophic Plate Count	**5700**	**>,V,Z**	**CFU/1mL**	**1**	1.0	1.0	3/23/2021 12:10	M
WET CHEMISTRY								
Analysis Desc: TOC,SM5310B,Water	Analytical Method: SM 5310B							
Total Organic Carbon	**2.8**		**mg/L**	**1**	1.0	0.50	3/25/2021 20:58	T

Lab ID: **M2101302006** Date Received: 03/22/21 17:35 Matrix: Water
Sample ID: **Gac Effluent #3** Date Collected: 03/22/21 16:15

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
Microbiology								
Analysis Desc: Heterotrophic Plate Count,9215B,DW	Analytical Method: SM 9215 B (Pour Plate)							
Heterotrophic Plate Count	**5700**	**>,V,Z**	**CFU/1mL**	**1**	1.0	1.0	3/23/2021 12:10	M
WET CHEMISTRY								
Analysis Desc: TOC,SM5310B,Water	Analytical Method: SM 5310B							
Total Organic Carbon	**1.6**		**mg/L**	**1**	1.0	0.50	3/25/2021 21:16	T

Lab ID: **M2101302007** Date Received: 03/22/21 17:35 Matrix: Water
Sample ID: **Gac Effluent #4** Date Collected: 03/22/21 16:15

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
Microbiology								
Analysis Desc: Heterotrophic Plate Count,9215B,DW	Analytical Method: SM 9215 B (Pour Plate)							

CERTIFICATE OF ANALYSIS

NELAP Accredited E82535

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Payments: P.O. Box 551580 Jacksonville, FL 32255-1580
Phone: (954)889-2288
Fax: (954)889-2281

ANALYTICAL RESULTS

Workorder: M2101302 City of Ft Lauderdale Fiveash

Lab ID: **M2101302007** Date Received: 03/22/21 17:35 Matrix: Water

Sample ID: **Gac Effluent #4** Date Collected: 03/22/21 16:15

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
Heterotrophic Plate Count	**5700**	**>,V,Z**	**CFU/1mL**	**1**	1.0	1.0	3/23/2021 12:10	M
WET CHEMISTRY								
Analysis Desc: TOC,SM5310B,Water	Analytical Method: SM 5310B							
Total Organic Carbon	**0.58**	**I**	**mg/L**	**1**	1.0	0.50	3/25/2021 22:29	T

CERTIFICATE OF ANALYSIS

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ANALYTICAL RESULTS QUALIFIERS

Workorder: M2101302 City of Ft Lauderdale Fiveash

PARAMETER QUALIFIERS

U	The compound was analyzed for but not detected.
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
V	Method Blank Contamination
B	Results based upon colony counts outside the acceptable range.
Z	Too numerous to count (TNTC); the reported numeric value takes into account the filtration volume.

LAB QUALIFIERS

M	DOH Certification #E82535(AEL-M)(FL NELAC Certification)
T	DOH Certification #E84589(AEL-T)(FL NELAC Certification)

Advanced Environmental Laboratories, Inc.
10200 USA Today Way Miramar, FL 33025
Payments: P.O. Box 551580 Jacksonville, FL 32255-1580
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QUALITY CONTROL DATA

Workorder: M2101302 City of Ft Lauderdale Fiveash

QC Batch: WCAm/1749 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Prepared:
Associated Lab Samples: M2101302001

METHOD BLANK: 3824312

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Chloride	mg/L	0.50	0.50	U

QC Batch: WCAt/2881 Analysis Method: SM 5310B
QC Batch Method: SM 5310B Prepared:
Associated Lab Samples: M2101302001, M2101302002, M2101302004, M2101302005, M2101302006

METHOD BLANK: 3827925

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Total Organic Carbon	mg/L	0.50	0.50	U

QC Batch: WCAt/2882 Analysis Method: SM 5310B
QC Batch Method: SM 5310B Prepared:
Associated Lab Samples: M2101302007

METHOD BLANK: 3827934

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Total Organic Carbon	mg/L	0.50	0.50	U

QC Batch: WCAt/2883 Analysis Method: SM 5310B
QC Batch Method: SM 5310B Prepared:
Associated Lab Samples: M2101302001, M2101302002

METHOD BLANK: 3827938

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				

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Phone: (954)889-2288
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QUALITY CONTROL DATA

Workorder: M2101302 City of Ft Lauderdale Fiveash

METHOD BLANK: 3827938

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
Dissolved Organic Carbon	mg/L	0.50	0.50	U

QC Batch: DGMm/1209 Analysis Method: EPA 200.7
QC Batch Method: EPA 200.7 Prepared: 03/26/2021 03:00
Associated Lab Samples: M2101302001

METHOD BLANK: 3829192

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
METALS				
Calcium	mg/L	0.20	0.20	U

QC Batch: WCAt/2924 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Prepared:
Associated Lab Samples: M2101302001

METHOD BLANK: 3830140

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Bromide	mg/L	0.10	0.10	U

QC Batch: WCAt/2938 Analysis Method: SM 2320B
QC Batch Method: SM 2320B Prepared:
Associated Lab Samples: M2101302001

METHOD BLANK: 3830836

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Alkalinity, Total	mg/L	5.0	5.0	U

QC Batch: WCAt/2966 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Prepared:

CERTIFICATE OF ANALYSIS

NELAP Accredited E82535

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Phone: (954)889-2288
Fax: (954)889-2281

QUALITY CONTROL DATA

Workorder: M2101302 City of Ft Lauderdale Fiveash

Associated Lab Samples: M2101302002

METHOD BLANK: 3831678

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Bromide	mg/L	0.10	0.10	U

QC Batch: MICm/1186 Analysis Method: SM 9215 B (Pour Plate)
QC Batch Method: SM 9215 B (Pour Plate) Prepared:
Associated Lab Samples: M2101302001, M2101302002, M2101302003, M2101302004, M2101302005, M2101302006, M2101302007

METHOD BLANK: 3834191

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
Microbiology				
Heterotrophic Plate Count	CFU/1mL	93.5	1.0	

QC Batch: WCAt/3234 Analysis Method: EPA 300.1
QC Batch Method: EPA 300.1 Prepared:
Associated Lab Samples: M2101302002

METHOD BLANK: 3845456

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Bromate	ug/L	3.8	3.8	U

QUALITY CONTROL DATA QUALIFIERS

Workorder: M2101302 City of Ft Lauderdale Fiveash

QUALITY CONTROL PARAMETER QUALIFIERS

U The compound was analyzed for but not detected.

I The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

J4 Estimated Result

CERTIFICATE OF ANALYSIS

NELAP Accredited E82535

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QUALITY CONTROL DATA QUALIFIERS

Workorder: M2101302 City of Ft Lauderdale Fiveash

QUALITY CONTROL PARAMETER QUALIFIERS

U	The compound was analyzed for but not detected.
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
V	Method Blank Contamination

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: M2101302 City of Ft Lauderdale Fiveash

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
M2101302001	Raw Water			EPA 300.0	WCAm/1749
M2101302001	Raw Water			SM 5310B	WCAt/2881
M2101302002	AOP Effluent			SM 5310B	WCAt/2881
M2101302004	Gac Effluent #1			SM 5310B	WCAt/2881
M2101302005	Gac Effluent #2			SM 5310B	WCAt/2881
M2101302006	Gac Effluent #3			SM 5310B	WCAt/2881
M2101302007	Gac Effluent #4			SM 5310B	WCAt/2882
M2101302001	Raw Water			SM 5310B	WCAt/2883
M2101302002	AOP Effluent			SM 5310B	WCAt/2883
M2101302001	Raw Water	EPA 200.7	DGMm/1209	EPA 200.7	ICPm/1211
M2101302001	Raw Water			EPA 300.0	WCAt/2924
M2101302001	Raw Water			SM 2320B	WCAt/2938
M2101302002	AOP Effluent			EPA 300.0	WCAt/2966
M2101302001	Raw Water			SM 9215 B (Pour Plate)	MICm/1186
M2101302002	AOP Effluent			SM 9215 B (Pour Plate)	MICm/1186
M2101302003	Tank Water			SM 9215 B (Pour Plate)	MICm/1186
M2101302004	Gac Effluent #1			SM 9215 B (Pour Plate)	MICm/1186
M2101302005	Gac Effluent #2			SM 9215 B (Pour Plate)	MICm/1186
M2101302006	Gac Effluent #3			SM 9215 B (Pour Plate)	MICm/1186
M2101302007	Gac Effluent #4			SM 9215 B (Pour Plate)	MICm/1186
M2101302002	AOP Effluent			EPA 300.1	WCAt/3234

Advanced Environmental Laboratories, Inc.

☐ Al ☐ Fe ☐ Ja ☐ Ta

M2101302

ID: E53076 192 095

Page 1 of 3

☐ Gainesville: 4955 SW 41st Blvd., FL 32608 • 352.377.2349 • Lab ID: E82001
☑ Miramar: 10200 USA Today Way, FL 33025 • 954.889.2288 • Lab ID: E82535
☐ Tampa: 9610 Princess Palm Ave., FL 33619 • 813.630.9616 • Lab ID: E84589

Client Name:	Reiss Engineering, Inc.	Project Name:	City of Ft. Lauderdale Fiveash
Address:	1016 Spring Villas Pt.	Project Number:	134002
	Winter Springs, FL 32708	PO Number:	
Phone:	407-679-5358	FDEP Facility No:	
FAX:		FDEP Facility Addr:	
Contact:	Christophe M. Robert		
Sampled By:		Special Instructions:	
Turn Around Time:	Standard Rush		
AEL Profile #:	6e377	ADaPT EQuIS Other	

SAMPLE ID	SAMPLE DESCRIPTION	Grab Comp	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. COUNT	BOTTLE SIZE & TYPE	ANALYSIS REQUIRED: Bromate by 300.1	Bromide by 300.0	TOC by SM5310B	DOC by SM5310B	Preservation	Field-Filtered?	LABORATORY I.D. NUMBER
												NaThio		
RAW WATER	RAW WATER TOC		3/22/21	3:15		1								001
RAW WATER	RAW WATER DOC		3/22/21	3:15		1								001
RAW WATER	RAW WATER ALKALINITY		3/22/21	3:15		1								001
RAW WATER	RAW WATER CALCIUM		3/22/21	3:15		1								001
RAW WATER	RAW WATER CHLORIDE		3/22/21	3:15		1								001
RAW WATER	BROMIDE		3/22/21	3:15		1								001
RAW WATER	RAW WATER HPC		3/22/21	3:15		1								001
ADP EFFLUENT	ADP EFFLUENT TOC		3/22/21	4:00		1								002
ADP EFFLUENT	ADP EFFLUENT DOC		3/22/21	4:00		1								002
ADP EFFLUENT	ADP EFFLUENT HPC		3/22/21	4:00		1								002

Matrix Code: WW = wastewater SW = surface water GW = ground water DW = drinking water O = oil A = air SO = soil SL = sludge Preservation Code: I = ice H=(HCl) S = (H2SO4) N = (HNO3) T = (Sodium Thiosulfate)

Received on Ice ☑ Yes ☐ No ☐ Temp taken from sample ☐ Temp from blank ☐ Where required, pH checked Temp. when received (observed) 5.2 °C Temp. when received (corrected) 4.2 °C

DCN: AD-D051web Form last revised 08/07/2019 Device used for measuring Temp by unique identifier (circle IR temp gun used) J: 9A G: LT-1 LT-2 T: 10A A: 3A M: 3A S: 1V F: 1A

	Relinquished by:	Date	Time	Received by:	Date	Time
1		3/22/21	1655		3/22/21	1655
2		3/22/21	1735		3/22/21	1735
3						
4						

FOR DRINKING WATER USE:

(When PWS Information not otherwise supplied) PWS ID:

Contact Person:

Supplier of Water:

Site-Address:

NELAP Accredited E82535

Advanced Environmental Laboratories, Inc.

☐ Altamonte Springs: 380 Northlake Blvd., Ste. 1048, FL 32701 • 407.937.1594 • Lab ID: E53076
☐ Fort Myers: 13100 Westlinks Terrace, Sta. 10, FL 33913 • 239.674.8130 • Lab ID: E84492
☐ Jacksonville: 6681 Southpoint Pkwy., FL 32216 • 904.363.9350 • Lab ID: E82574
☐ Tallahassee: 2539 North Monroe St., Suite D, FL 32303 • 850.219.6274 • Lab ID: E811095
☐ Gainesville: 4955 SW 41st Blvd., FL 32608 • 352.377.2349 • Lab ID: E62001
☑ Miramar: 10200 USA Today Way, FL 33025 • 954.889.2288 • Lab ID: E82535
☐ Tampa: 9610 Princess Palm Ave., FL 33619 • 813.630.9616 • Lab ID: E84589

M2101302

Client Name:	Reiss Engineering, Inc.	Project Name:	City of Ft. Lauderdale Fiveash
Address:	1016 Spring Villas Pt.	Project Number:	134002
	Winter Springs, FL 32708	PO Number:	
Phone:	407-679-5358	FDEP Facility No:	
FAX:		FDEP Facility Addr:	
Contact:	Christophe M. Robert		
Sampled By:		Special Instructions:	
Turn Around Time:	Standard Rush		
AEL Profile #:		ADaPT EQuIS Other	

SAMPLE ID	SAMPLE DESCRIPTION	Grab Comp	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. COUNT	Bromate (NaThio)	Bromide	Chloride/Sulfate	Alkalinity	TSS	Ca, Total	LABORATORY I.D. NUMBER
AOP EFFLUENT	AOP EFFLUENT BROMIDE		3/22/21	4:xx		1							002
AOP EFFLUENT	AOP EFFLUENT BROMATE		3/22/21	4:06		1							002
TANK WATER	TANK WATER HPC		3/22/21	4:15		1							003
GAC EFFLUENT	GAC EFFLUENT TOC #1		3/22/21	4:15		1							004
GAC EFFLUENT	GAC EFFLUENT HPC #1		3/22/21	4:15		1							004
GAC EFFLUENT	GAC EFFLUENT TOC #2		3/22/21	4:15		1							005
GAC EFFLUENT	GAC EFFLUENT HPC #2		3/22/21	4:15		1							005
GAC EFFLUENT	GAC EFFLUENT TOC #3		3/22/21	4:15		1							006
GAC EFFLUENT	GAC EFFLUENT HPC #3		3/22/21	4:15		1							006
GAC EFFLUENT	GAC EFFLUENT TOC #4		3/22/21	4:15		1							007

Matrix Code: WW = wastewater SW = surface water GW = ground water DW = drinking water O = oil A = air SO = soil SL = sludge

Preservation Code: I = ice H=(HCl) S = (H2SO4) N = (HNO3) T = (Sodium Thiosulfate)

Received on Ice ☑ Yes ☐ No ☑ Temp taken from sample ☐ Temp from blank ☐ Where required, pH checked

Temp. when received (observed) 5.2 °C Temp. when received (corrected) 4.2 °C

DCN: AD-D051web Form last revised 08/07/2019

Device used for measuring Temp by unique identifier (circle IR temp gun used) J: 9A G: LT-1 LT-2 T: 10A A: 3A (M: 3A) S: 1V F: 1A

	Relinquished by:	Date	Time	Received by:	Date	Time
1		3/22/21	1655		3/22/21	1655
2		3/22/21	1735		3/22/21	1735
3						
4						

FOR DRINKING WATER USE:

(When PWS Information not otherwise supplied) PWS ID:

Contact Person:

Supplier of Water:

Site-Address:

Advanced Environmental Laboratories, Inc.

☐ Altam ☐ Fort M ☐ Jacks ☐ Tallah

☐ Gainesville: 4965 SW 41st Blvd., FL 32608 • 352.377.2349 • Lab ID: E82001
☑ Miramar: 10200 USA Today Way, FL 33025 • 954.889.2288 • Lab ID: E82535
☐ Tampa: 9610 Princess Palm Ave., FL 33619 • 813.630.9616 • Lab ID: E84589

M2101302

53076

Client Name:	Reiss Engineering, Inc.	Project Name:	City of Ft. Lauderdale Fiveash
Address:	1016 Spring Villas Pt.	Project Number:	134002
	Winter Springs, FL 32708	PO Number:	
Phone:	407-679-5358	FDEP Facility No:	
FAX:		FDEP Facility Addr:	
Contact:	Christophe M. Robert		
Sampled By:		Special Instructions:	
Turn Around Time:	Standard Rush		
AEL Profile #:		ADaPT EQuIS Other	

SAMPLE ID	SAMPLE DESCRIPTION	Grab Comp	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. COUNT	BOTTLE SIZE & TYPE	ANALYSIS REQUIRED: Bromate by 300.1	Bromide by 300.0	TOC by SM5310B	DOC by SM5310B	LABORATORY I.D. NUMBER
							Preservation	NaThio				
							Field-Filtered?					
GAC Effluent	GAC EFFLUENT AFC #4		3/22/21	4:15		1						007

Matrix Code: WW = wastewater SW = surface water GW = ground water DW = drinking water O = oil A = air SO = soil SL = sludge

Preservation Code: I = ice H=(HCl) S = (H2SO4) N = (HNO3) T = (Sodium Thiosulfate)

Received on Ice ☑ Yes ☐ No ☐ Temp taken from sample ☐ Temp from blank ☐ Where required, pH checked

Temp. when received (observed) 5.2 °C Temp. when received (corrected) 4.2 °C

DCN: AD-D051web Form last revised 08/07/2019

Device used for measuring Temp by unique identifier (circle IR temp gun used) J: 9A G: LT-1 LT-2 T: 10A A: 3A M: 3A S: 1V F: 1A

	Relinquished by:	Date	Time	Received by:	Date	Time
1		3/22/21	1655		3/22/21	1655
2		3/22/21	1735		3/22/21	1735
3						
4						

FOR DRINKING WATER USE:

(When PWS Information not otherwise supplied) PWS ID:

Contact Person:

Supplier of Water:

Site-Address:

NELAP Accredited E82535

Advanced Environmental Laboratories, Inc.

Work Order: M2101302
Client: Reiss Engineering, Inc.
Project ID: City of Ft Lauderdale Fiveash

I. Receipt

No Exceptions were encountered.

II. Holding Times

Preparation: All holding times were met.

Analysis: The analysis of T2105271003 and T2105271006 was initially analyzed in hold for Chlorite, but the samples required reanalysis at a dilution past the recommended holding time. Efforts were made to reanalyze the samples as soon as the initial run was completed. The data is qualified to indicate the holding time violation.

III. Method

Analysis: EPA 300.1

Preparation:

IV. Preparation

Sample preparation proceeded normally.

V. Analysis

Calibration: All acceptance criteria were met.

Blanks: All acceptance criteria were met.

Surrogates: All acceptance criteria were met.

Spikes All acceptance criteria were met.

Internal Standard: All acceptance criteria were met.

Samples: All acceptance criteria were met.

Other: All acceptance criteria were met.

Serial Dilution: All acceptance criteria were met.

Duplicates: All acceptance criteria were met.

Advanced Environmental Laboratories, Inc.

Work Order: M2101302
Client: Reiss Engineering, Inc.
Project ID: City of Ft Lauderdale Fiveash

I. Receipt

No Exceptions were encountered.

II. Holding Times

Preparation: All holding times were met.

Analysis: All holding times were met.

III. Method

Analysis: EPA 300.0

Preparation:

IV. Preparation

Sample preparation proceeded normally.

V. Analysis

Calibration: The upper control criterion was exceeded for Nitrite in Continuing Calibration Verification (CCV) standards for analytical batch 1749. The client samples reported in this batch did not contain the analytes in question. Since the apparent problem equates to a potential high bias, the data quality is not affected. No further corrective action was required.

Blanks: All acceptance criteria were met.

Surrogates: All acceptance criteria were met.

Spikes The matrix spike (MS) recoveries of Chloride for M2101293001 were outside control criteria. Recoveries in the Laboratory Control Sample (LCS) and % RPD were acceptable, which indicates the analytical batch was in control. The matrix spike outlier suggests a potential low bias in this matrix. The affected sample is qualified to indicate matrix interference.

Internal Standard: All acceptance criteria were met.

Samples: All acceptance criteria were met.

Other: All acceptance criteria were met.

Serial Dilution: All acceptance criteria were met.

Duplicates: All acceptance criteria were met.

Advanced Environmental Laboratories, Inc.

Work Order: M2101302
Client: Reiss Engineering, Inc.
Project ID: City of Ft Lauderdale Fiveash

I. Receipt

No Exceptions were encountered.

II. Holding Times

Preparation: All holding times were met.

Analysis: All holding times were met.

III. Method

Analysis: SM 9215 B (Pour Plate)

Preparation:

IV. Preparation

Sample preparation proceeded normally.

V. Analysis

Calibration: All acceptance criteria were met.

Blanks: The blank for this batch had a result of 93.5 cfu/mL. All samples in this run were qualified to reflect this in accordance with AEL QA, to indicated that the data may be impacted by the contamination and should be viewed as an estimate.

Surrogates: All acceptance criteria were met.

Spikes All acceptance criteria were met.

Internal Standard: All acceptance criteria were met.

Samples: All acceptance criteria were met.

Other: All acceptance criteria were met.

Serial Dilution: All acceptance criteria were met.

Duplicates: All acceptance criteria were met.

Accurate Environmental Laboratories

May 05, 2021

Client: Reiss Engineering, Inc.

1016 Spring Villas Pt.

Winter Springs, FL 32708

Requested By: Planning - Design - Construction

NELAP ACCREDITED TNI LABORATORY

National Environmental Laboratory Accreditation Program
ODEQ TNI Certified

Sample Project Name:

Date Samples Received: April 05, 2021 Time: 9:00 sample temp upon arrival at lab = 17.10°C

Matrix: Drinking Water

Lab Log Numbers: **DD05004-01** **DD05004-02** **DD05004-03**

Work Order: DD05004

Report # DD05004-0505210944

EPA Lab ID#'s: **Stillwater OK00092 Tulsa OK00983 OKC OK00129 ICR OK 001**

Oklahoma Certification: Stillwater NELAP WasteWater, ODEQ 8316/ Drinking Water, DEQ D9602

NELAP Tulsa WasteWater, ODEQ 9905 / Drinking Water, DEQ D9901

Oklahoma City NELAP WasteWater ODEQ 7202 / Drinking Water, DEQ D9937

Kansas Certification: Stillwater NELAP CERT # E-10219

Oklahoma City NELAP CERT # E-10414

Texas Certification: Stillwater Drinking Water NELAP CERT # T105704533-14-1

Method Reference: 40 CFR 136, 141, and 261 Methods for Chemical Analysis of Water and Wastes EPA-600/4-79-020, March 1983. Test Methods for Evaluating Solid Wastes, SW-846, Final Update III. Standard Methods 1998 (20th Edition), Standard Methods 2005 (21st Edition) and Standard Methods 2011 (22nd Edition) for the Examination of Water and Wastewater.

Analysis Reference: If qualifiers present in "Prep Info" or "Analysis Info", then analysis performed as follows: @= Tulsa Lab and * = OKC Lab. If no qualifiers present, then analysis performed at Stillwater Lab.

Accurate Environmental Laboratories certify that the test results performed at the Stillwater lab meet all requirements of NELAP. Any exceptions to this can be found in the report footer or Quality Control Section of the report.

This report is to only be replicated in its entirety.

Accurate Environmental sampling protocol was followed for any sampling performed by Accurate Field Services.

Sample: ***AOP*** **Location Code:** **PWSID#:**

Collection Type: Grab Sample Time: 3/31/21 14:00 **Lab Log#** DD05004-01

Method/Parameter	Test	Result	Notes	PQL#	Prep Info	Analysis Info
Biodegradable Dissolved Organic Carbon (No Cert.)	Biodegradable Dissolved Organic Carbon	1140 ug C/L		25.0	04/06/21 19:00 OHB	05/04/21 13:10 OHB

Sample: ***BAC Col #1*** **Location Code:** **PWSID#:**

Collection Type: Grab Sample Time: 3/31/21 14:15 **Lab Log#** DD05004-02

Method/Parameter	Test	Result	Notes	PQL#	Prep Info	Analysis Info
Biodegradable Dissolved Organic Carbon (No Cert.)	Biodegradable Dissolved Organic Carbon	79.0 ug C/L		25.0	04/06/21 19:00 OHB	05/04/21 16:25 OHB

Sample: ***BAC Col #2*** **Location Code:** **PWSID#:**

Collection Type: Grab Sample Time: 3/31/21 14:20 **Lab Log#** DD05004-03

Method/Parameter	Test	Result	Notes	PQL#	Prep Info	Analysis Info
Biodegradable Dissolved Organic Carbon (No Cert.)	Biodegradable Dissolved Organic Carbon	53.0 ug C/L		25.0	04/06/21 19:00 OHB	05/04/21 19:51 OHB

Notes and Definitions

MCL Analyte concentration may exceed Maximum Contaminant Limit (MCL) for EPA Primary or Secondary Drinking Water Regulations.

Analyte concentration may exceed regulatory limit.

PQL Practical Quantitation Limit - the method reporting limit (MRL) adjusted for any dilutions or other changes made to the sample to deal with interferences/matrix effects

BPQL Below Practical Quantitation Limit (if applicable).

The "Prep Date" of the QC analysis coincides with the characters of the appropriate QC Lab ID. (Example: 19 A 02 15 - BLK = 2019, Jan 2, Batch #15 - Blank)

Lab Manager

* Complete Entire COC to be in Compliance*

☐ RUSH Due Date _____

Accurate Environmental Labs

Chain of Custody

Client Name- **REISS ENGINEERING, INC.**

Project Name-

Accurate Work Order #	Date Sample Taken	Time Sample Taken	Matrix or Source (Refer below)	Grab (G) or Comp (C)	Client I.D. / Sample Location or DEQ / EPA Location Code	Field Results (pH, Temp, Chlorine, …) (note analysis & units) Location Code			Sample Preserv. & Container →	Ice 1000 mL Plastic							
									Analysis Requested →	BDOC (biodegradable dissolved organic carbon)							
DD05004									# of Container ↓								
-01	3/31/21	2 pm	DW	G	AOP				1	1							
-02	3/31/21	2:15 pm	DW	G	BAC Col#1				1	1							
-03	3/31/21	2:20 pm	DW	G	BAC Col#2				1	1							

On-Site Info Raw **Alkalinity** (TOC Raw)= _____ mg/L **Turbidity** (E.Coli)= _____ ntu

Matrix Codes **DW** = Drinking Water **WW** = Wastewater **SL** = Sludge **O** = Other_____

E.Coli Source- **GWUDI-FS**= Groundwater under direct influence of Flowing Stream **GWUDI-RL**= Groundwater under direct influence of Reservoir/Lake

Field Instrument Calibration -				
Meter Type	Standards	Final Read.	Date , Time	Initials

Comments

-- All samples are scheduled to be disposed of in 4 weeks of receipt at Accurate.--

Certification by Company Official: I hereby certify that the above sampling occurred during a period such that the sample(s) is/are representative of a typical operating day discharge for the above facility. Signature : Date/Time

Sampled By: Antoine Sands Company: Reiss Engineering, Inc. Sample Method:

Relinquished By: Christophe Robert	Date/Time 4/2/21 10 am	Received By: ✓		Date/Time
☐ Relinquished to Lab By: ☐ Relq'd to Log-In Fridge By: UPS	Date/Time 4/5/21 900 am	Received at Lab By: Makenzie Kleinman	Rec'd °C 17.1	Date/Time 4/5/21 9000

Reporting Requirements (standard 10-15 working days)	Compliance Reporting? Yes or No (DMR, PWS,)	Oklahoma PWS ID #	RUSH Request (if available) _____ (Working Days)

Mail Report: REISS ENGINEERING, INC.
PLANNING - DESIGN - CONSTRUCTION
Address 1016 Spring Villas Pt.
Winter Springs, FL 32708
Phone #: **407.679.5358**
Email: **cmrobert@reisseng.com**

Mail Invoice: REISS ENGINEERING, INC.
PLANNING - DESIGN - CONSTRUCTION
Address: 1016 Spring Villas Pt.
Winter Springs, FL 32708
cmrobert@reisseng.com
Bid # -
PO # -
102820 tkw
Phone #: Fax #:

www.accuratelabs.com (800) 516-5227	505 South Lowry Street Stillwater, OK 74074 Phone: (405) 372-5300 Fax: (405) 372-5396	3910 East 51st Street Tulsa, OK 74135 Phone: (918) 663-5400 Fax: (918) 663-6300	12036 N. Pennsylvania Oklahoma City, OK 73120 Phone: (405) 751-3132 Fax: (405) 751-3108

Failure to complete this Chain of Custody form correctly may delay turnaround time of analytical reporting.

Advanced Environmental Laboratories, Inc.
10200 USA Today Way Miramar, FL 33025
Payments: P.O. Box 551580 Jacksonville, FL 32255-1580
Phone: (954)889-2288
Fax: (954)889-2281

May 13, 2021

Christophe M. Robert
Reiss Engineering, Inc.
1016 Spring Villas Pt.
Winter Springs, FL 32708

RE: Workorder: M2101976 City of Ft Lauderdale Fiveash

Dear Christophe Robert:

Enclosed are the analytical results for sample(s) received by the laboratory on Thursday, April 29, 2021. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report. The analytical results for the samples contained in this report were submitted for analysis as outlined by the Chain of Custody and results pertain only to these samples.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Deb Griffith - Client Services Manager
DGriffith@aellab.com

Enclosures

CERTIFICATE OF ANALYSIS

NELAP Accredited E82535

Advanced Environmental Laboratories, Inc.
10200 USA Today Way Miramar, FL 33025
Payments: P.O. Box 551580 Jacksonville, FL 32255-1580
Phone: (954)889-2288
Fax: (954)889-2281

SAMPLE SUMMARY

Workorder: M2101976 City of Ft Lauderdale Fiveash

Lab ID	Sample ID	Matrix	Date Collected	Date Received
M2101976001	AOP INF	Water	4/28/2021 11:52	4/29/2021 16:30
M2101976002	AOP EFF	Water	4/28/2021 11:53	4/29/2021 16:30
M2101976003	BAC EFF COLUMN 1	Water	4/28/2021 12:00	4/29/2021 16:30
M2101976004	BAC EFF COLUMN 2	Water	4/28/2021 12:02	4/29/2021 16:30
M2101976005	BAC EFF COLUMN 3	Water	4/28/2021 12:04	4/29/2021 16:30
M2101976006	BAC EFF COLUMN 4	Water	4/28/2021 12:06	4/29/2021 16:30
M2101976007	AOP INF	Water	4/28/2021 14:00	4/29/2021 16:30
M2101976008	AOP EFF	Water	4/28/2021 14:02	4/29/2021 16:30
M2101976009	BAC EFF COLUMN 1	Water	4/28/2021 14:10	4/29/2021 16:30
M2101976010	BAC EFF COLUMN 2	Water	4/28/2021 14:12	4/29/2021 16:30
M2101976011	BAC EFF COLUMN 3	Water	4/28/2021 14:16	4/29/2021 16:30
M2101976012	BAC EFF COLUMN 4	Water	4/28/2021 14:18	4/29/2021 16:30
M2101976013	AOP INF	Water	4/28/2021 14:20	4/29/2021 16:30
M2101976014	AOP EFF	Water	4/28/2021 14:22	4/29/2021 16:30
M2101976015	AOP INF	Water	4/28/2021 14:26	4/29/2021 16:30
M2101976016	AOP INF	Water	4/28/2021 14:30	4/29/2021 16:30
M2101976017	AOP INF	Water	4/28/2021 14:40	4/29/2021 16:30
M2101976018	AOP EFF	Water	4/28/2021 14:42	4/29/2021 16:30
M2101976019	AOP INF	Water	4/28/2021 14:44	4/29/2021 16:30
M2101976020	AOP EFF 1	Water	4/28/2021 14:46	4/29/2021 16:30
M2101976021	AOP EFF 2	Water	4/28/2021 14:48	4/29/2021 16:30
M2101976022	AOP INF	Water	4/28/2021 14:55	4/29/2021 16:30
M2101976023	AOP EFF	Water	4/28/2021 14:56	4/29/2021 16:30
M2101976024	BAC EFF COLUMN #1	Water	4/28/2021 14:58	4/29/2021 16:30
M2101976025	BAC EFF COLUMN #2	Water	4/28/2021 15:00	4/29/2021 16:30
M2101976026	BAC EFF COLUMN #3	Water	4/28/2021 15:02	4/29/2021 16:30
M2101976027	BAC EFF COLUMN #4	Water	4/28/2021 15:04	4/29/2021 16:30

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Phone: (954)889-2288
Fax: (954)889-2281

ANALYTICAL RESULTS

Workorder: M2101976 City of Ft Lauderdale Fiveash

Lab ID: **M2101976001** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **AOP INF** Date Collected: 04/28/21 11:52

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: TOC,SM5310B,Water	Analytical Method: SM 5310B							
Total Organic Carbon	**7.6**		**mg/L**	**1**	1.0	0.50	5/7/2021 16:38	T

Lab ID: **M2101976002** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **AOP EFF** Date Collected: 04/28/21 11:53

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: TOC,SM5310B,Water	Analytical Method: SM 5310B							
Total Organic Carbon	**7.9**		**mg/L**	**1**	1.0	0.50	5/7/2021 17:17	T

Lab ID: **M2101976003** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **BAC EFF COLUMN 1** Date Collected: 04/28/21 12:00

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: TOC,SM5310B,Water	Analytical Method: SM 5310B							
Total Organic Carbon	**7.2**		**mg/L**	**1**	1.0	0.50	5/7/2021 17:30	T

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ANALYTICAL RESULTS

Workorder: M2101976 City of Ft Lauderdale Fiveash

Lab ID: **M2101976004** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **BAC EFF COLUMN 2** Date Collected: 04/28/21 12:02

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: TOC,SM5310B,Water	Analytical Method: SM 5310B							
Total Organic Carbon	**4.6**		**mg/L**	**1**	1.0	0.50	5/7/2021 17:48	T

Lab ID: **M2101976005** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **BAC EFF COLUMN 3** Date Collected: 04/28/21 12:04

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: TOC,SM5310B,Water	Analytical Method: SM 5310B							
Total Organic Carbon	**3.9**		**mg/L**	**1**	1.0	0.50	5/7/2021 18:01	T

Lab ID: **M2101976006** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **BAC EFF COLUMN 4** Date Collected: 04/28/21 12:06

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: TOC,SM5310B,Water	Analytical Method: SM 5310B							
Total Organic Carbon	**3.0**		**mg/L**	**1**	1.0	0.50	5/7/2021 18:14	T

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ANALYTICAL RESULTS

Workorder: M2101976 City of Ft Lauderdale Fiveash

Lab ID: **M2101976007** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **AOP INF** Date Collected: 04/28/21 14:00

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: DOC,SM5310B,Water	Analytical Method: SM 5310B							
Dissolved Organic Carbon	**8.1**		**mg/L**	**1**	1.0	0.50	5/6/2021 16:39	T

Lab ID: **M2101976008** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **AOP EFF** Date Collected: 04/28/21 14:02

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: DOC,SM5310B,Water	Analytical Method: SM 5310B							
Dissolved Organic Carbon	**9.7**		**mg/L**	**1**	1.0	0.50	5/6/2021 17:19	T

Lab ID: **M2101976009** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **BAC EFF COLUMN 1** Date Collected: 04/28/21 14:10

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: DOC,SM5310B,Water	Analytical Method: SM 5310B							
Dissolved Organic Carbon	**8.6**		**mg/L**	**1**	1.0	0.50	5/6/2021 17:32	T

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ANALYTICAL RESULTS

Workorder: M2101976 City of Ft Lauderdale Fiveash

Lab ID: **M2101976010** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **BAC EFF COLUMN 2** Date Collected: 04/28/21 14:12

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: DOC,SM5310B,Water	Analytical Method: SM 5310B							
Dissolved Organic Carbon	**4.5**		**mg/L**	**1**	1.0	0.50	5/6/2021 18:01	T

Lab ID: **M2101976011** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **BAC EFF COLUMN 3** Date Collected: 04/28/21 14:16

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: DOC,SM5310B,Water	Analytical Method: SM 5310B							
Dissolved Organic Carbon	**4.2**		**mg/L**	**1**	1.0	0.50	5/6/2021 18:40	T

Lab ID: **M2101976012** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **BAC EFF COLUMN 4** Date Collected: 04/28/21 14:18

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: DOC,SM5310B,Water	Analytical Method: SM 5310B							
Dissolved Organic Carbon	**4.0**		**mg/L**	**1**	1.0	0.50	5/6/2021 18:54	T

CERTIFICATE OF ANALYSIS

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ANALYTICAL RESULTS

Workorder: M2101976 City of Ft Lauderdale Fiveash

Lab ID: **M2101976013** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **AOP INF** Date Collected: 04/28/21 14:20

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: Alkalinity,SM2320B,Water	Analytical Method: SM 2320B							
Alkalinity, Total	**70**		**mg/L**	**1**	20	5.0	5/6/2021 16:24	T

Lab ID: **M2101976014** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **AOP EFF** Date Collected: 04/28/21 14:22

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: Alkalinity,SM2320B,Water	Analytical Method: SM 2320B							
Alkalinity, Total	**90**		**mg/L**	**1**	20	5.0	5/6/2021 16:29	T

Lab ID: **M2101976015** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **AOP INF** Date Collected: 04/28/21 14:26

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
METALS								
Analysis Desc: E200.7 Analysis,Waters	Preparation Method: EPA 200.7 Analytical Method: EPA 200.7							
Calcium	**39**	**V**	**mg/L**	**1**	0.80	0.20	5/4/2021 16:01	M

CERTIFICATE OF ANALYSIS

NELAP Accredited E82535

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ANALYTICAL RESULTS

Workorder: M2101976 City of Ft Lauderdale Fiveash

Lab ID: **M2101976016** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **AOP INF** Date Collected: 04/28/21 14:30

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: IC,E300.0,Water	Analytical Method: EPA 300.0							
Chloride	**50**	**J4**	**mg/L**	**1**	5.0	0.50	4/30/2021 12:29	M

Lab ID: **M2101976017** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **AOP INF** Date Collected: 04/28/21 14:40

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: IC,E300.0,Water	Analytical Method: EPA 300.0							
Bromide	**0.20**	**U**	**mg/L**	**2**	1.0	0.20	5/6/2021 20:01	T

Lab ID: **M2101976018** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **AOP EFF** Date Collected: 04/28/21 14:42

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: IC,E300.0,Water	Analytical Method: EPA 300.0							
Bromide	**0.20**	**U**	**mg/L**	**2**	1.0	0.20	5/6/2021 20:17	T

CERTIFICATE OF ANALYSIS

NELAP Accredited E82535

Advanced Environmental Laboratories, Inc.
10200 USA Today Way Miramar, FL 33025
Payments: P.O. Box 551580 Jacksonville, FL 32255-1580
Phone: (954)889-2288
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ANALYTICAL RESULTS

Workorder: M2101976 City of Ft Lauderdale Fiveash

Lab ID: **M2101976019** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **AOP INF** Date Collected: 04/28/21 14:44

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: IC,E300.1,Water	Analytical Method: EPA 300.1							
Bromate	**3.8**	**U**	**ug/L**	**1**	10	3.8	5/11/2021 08:17	T

Lab ID: **M2101976020** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **AOP EFF 1** Date Collected: 04/28/21 14:46

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: IC,E300.1,Water	Analytical Method: EPA 300.1							
Bromate	**3.8**	**U**	**ug/L**	**1**	10	3.8	5/11/2021 08:56	T

Lab ID: **M2101976021** Date Received: 04/29/21 16:30 Matrix: Water
Sample ID: **AOP EFF 2** Date Collected: 04/28/21 14:48

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: IC,E300.1,Water	Analytical Method: EPA 300.1							
Bromate	**3.8**	**U**	**ug/L**	**1**	10	3.8	5/11/2021 09:35	T

CERTIFICATE OF ANALYSIS

NELAP Accredited E82535

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Payments: P.O. Box 551580 Jacksonville, FL 32255-1580
Phone: (954)889-2288
Fax: (954)889-2281

ANALYTICAL RESULTS QUALIFIERS

Workorder: M2101976 City of Ft Lauderdale Fiveash

PARAMETER QUALIFIERS

U	The compound was analyzed for but not detected.
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
V	Method Blank Contamination
J4	Estimated Result

LAB QUALIFIERS

M	DOH Certification #E82535(AEL-M)(FL NELAC Certification)
T	DOH Certification #E84589(AEL-T)(FL NELAC Certification)

Advanced Environmental Laboratories, Inc.
10200 USA Today Way Miramar, FL 33025
Payments: P.O. Box 551580 Jacksonville, FL 32255-1580
Phone: (954)889-2288
Fax: (954)889-2281

QUALITY CONTROL DATA

Workorder: M2101976 City of Ft Lauderdale Fiveash

QC Batch: WCAm/2163 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Prepared:
Associated Lab Samples: M2101976016

METHOD BLANK: 3871160

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Chloride	mg/L	0.50	0.50	U

QC Batch: DGMm/1322 Analysis Method: EPA 200.7
QC Batch Method: EPA 200.7 Prepared: 05/04/2021 05:00
Associated Lab Samples: M2101976015

METHOD BLANK: 3873499

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
METALS				
Calcium	mg/L	0.95	0.20	

QC Batch: WCAt/3947 Analysis Method: SM 2320B
QC Batch Method: SM 2320B Prepared:
Associated Lab Samples: M2101976013, M2101976014

METHOD BLANK: 3876592

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Alkalinity, Total	mg/L	5.0	5.0	U

QC Batch: WCAt/3956 Analysis Method: SM 5310B
QC Batch Method: SM 5310B Prepared:
Associated Lab Samples: M2101976007, M2101976008, M2101976009, M2101976010, M2101976011, M2101976012

METHOD BLANK: 3877406

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				

CERTIFICATE OF ANALYSIS

NELAP Accredited E82535

Advanced Environmental Laboratories, Inc.
10200 USA Today Way Miramar, FL 33025
Payments: P.O. Box 551580 Jacksonville, FL 32255-1580
Phone: (954)889-2288
Fax: (954)889-2281

QUALITY CONTROL DATA

Workorder: M2101976 City of Ft Lauderdale Fiveash

METHOD BLANK: 3877406

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
Dissolved Organic Carbon	mg/L	0.50	0.50	U

QC Batch: WCAt/3984 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Prepared:
Associated Lab Samples: M2101976017, M2101976018

METHOD BLANK: 3878776

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Bromide	mg/L	0.10	0.10	U

QC Batch: WCAt/4000 Analysis Method: SM 5310B
QC Batch Method: SM 5310B Prepared:
Associated Lab Samples: M2101976001, M2101976002, M2101976003, M2101976004, M2101976005, M2101976006

METHOD BLANK: 3879441

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Total Organic Carbon	mg/L	0.50	0.50	U

QC Batch: WCAt/4141 Analysis Method: EPA 300.1
QC Batch Method: EPA 300.1 Prepared:
Associated Lab Samples: M2101976019, M2101976020, M2101976021

METHOD BLANK: 3885681

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Bromate	ug/L	3.8	3.8	U

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QUALITY CONTROL DATA QUALIFIERS

Workorder: M2101976 City of Ft Lauderdale Fiveash

QUALITY CONTROL PARAMETER QUALIFIERS

U	The compound was analyzed for but not detected.
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
J4	Estimated Result
V	Method Blank Contamination

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: M2101976 City of Ft Lauderdale Fiveash

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
M2101976016	AOP INF			EPA 300.0	WCAm/2163
M2101976015	AOP INF	EPA 200.7	DGMm/1322	EPA 200.7	ICPm/1318
M2101976013	AOP INF			SM 2320B	WCAt/3947
M2101976014	AOP EFF			SM 2320B	WCAt/3947
M2101976007	AOP INF			SM 5310B	WCAt/3956
M2101976008	AOP EFF			SM 5310B	WCAt/3956
M2101976009	BAC EFF COLUMN 1			SM 5310B	WCAt/3956
M2101976010	BAC EFF COLUMN 2			SM 5310B	WCAt/3956
M2101976011	BAC EFF COLUMN 3			SM 5310B	WCAt/3956
M2101976012	BAC EFF COLUMN 4			SM 5310B	WCAt/3956
M2101976017	AOP INF			EPA 300.0	WCAt/3984
M2101976018	AOP EFF			EPA 300.0	WCAt/3984
M2101976001	AOP INF			SM 5310B	WCAt/4000
M2101976002	AOP EFF			SM 5310B	WCAt/4000
M2101976003	BAC EFF COLUMN 1			SM 5310B	WCAt/4000
M2101976004	BAC EFF COLUMN 2			SM 5310B	WCAt/4000
M2101976005	BAC EFF COLUMN 3			SM 5310B	WCAt/4000
M2101976006	BAC EFF COLUMN 4			SM 5310B	WCAt/4000
M2101976019	AOP INF			EPA 300.1	WCAt/4141
M2101976020	AOP EFF 1			EPA 300.1	WCAt/4141
M2101976021	AOP EFF 2			EPA 300.1	WCAt/4141

Advanced Environmental Laboratories, Inc.

☐ Altamonte Sprin
☐ Fort Myers: 1310
☐ Jacksonville: 668
☐ Tallahassee: 263

M2101976

Page 1 of 1

☐ Gainesville: 4965 SW 41st Blvd., FL 32608 • 352.377.2349 • Lab ID: E82001
☑ Miramar: 10200 USA Today Way, FL 33025 • 954.889.2288 • Lab ID: E82535
☐ Tampa: 9610 Princess Palm Ave., FL 33619 • 813.630.9616 • Lab ID: E84589

Client Name:	Reiss Engineering, Inc.	Project Name:	City of Ft. Lauderdale Fiveash
Address:	1016 Spring Villas Pt.	Project Number:	134902
	Winter Springs, FL 32708	PO Number:	
Phone:	407-679-5358	FDEP Facility No:	
FAX:		FDEP Facility Addr:	
Contact:	Christophe M. Robert		
Sampled By:		Special Instructions:	
Turn Around Time:	Standard Rush		
AEL Profile #:		ADaPT EQuIS Other	

SAMPLE ID	SAMPLE DESCRIPTION	Grab Comp	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. COUNT	Bromate	Bromide	Chloride	Alkalinity	TSS	Ca, Total	TOC	DOC	HPC		LABORATORY I.D. NUMBER
	BOTTLE SIZE & TYPE																
	ANALYSIS REQUIRED						Bromate	Bromide	Chloride	Alkalinity	TSS	Ca, Total	TOC	DOC	HPC		LABORATORY I.D. NUMBER
	Preservation						NaThio										
	Field-Filtered?																
	6 TOC AOP IN AOP OUT 4 BAC EFFLUENTS					6							6				
	6 DOC AOP IN AOP OUT 4 BAC EFFLUENTS					6								6			
	2 Alkalinity AOP IN AOP OUT					2				2							
	1 Calcium AOP IN					1			*			1					
	1 Chloride AOP IN					1		*	1								
	2 Bromide AOP IN / AOP OUT					2		2									
	3 Bromate 1 AOP IN 2 AOP OUT					3	3										
	6 HPC AOP IN - AOP OUT 4 BAC EFFLUENTS					6									6		

Matrix Code: WW = wastewater SW = surface water GW = ground water DW = drinking water O = oil A = air SO = soil SL = sludge

Preservation Code: I = ice H=(HCl) S = (H2SO4) N = (HNO3) T = (Sodium Thiosulfate)

Received on Ice ☑Yes ☐No ☑Temp taken from sample ☐ Temp from blank ☐ Where required, pH checked

Temp. when received (observed) 5.8 °C Temp. when received (corrected) 4.8 °C

DCN: AD-D051web Form last revised 08/07/2019

Device used for measuring Temp by unique identifier (circle IR temp gun used) J: 9A G: LT-1 LT-2 T: 10A A: 3A M: 3A S: 1V F: 1A

	Relinquished by:	Date	Time	Received by:	Date	Time
1	Antoine Sands	4/28	16:00		4/29/21	1545
2		4/29/21	1630		4/29/21	1630
3						
4						

FOR DRINKING WATER USE:

(When PWS Information not otherwise supplied) PWS ID:

Contact Person:

Supplier of Water:

Site-Address:

NELAP Accredited E82535

Advanced Environmental Labs Inc

Five Ash

Client: Reiss Eng. Project name: City of Ft Lauderdale

Date/Time Rcvd: 4/29/21 1630 Log-In request number: M2169974

Received by: Gavin Evans Completed by: Megan Lara

Cooler/Shipping Information:

Courier: ☑ AEL ☐ Client ☐ UPS ☐ Blue Streak ☐ FedEx ☐ AES ☐ ASAP ☐ Other (describe):_____

Type: ☑ Cooler ☐ Box ☐ Other (describe) _____

Cooler temperature: Identify the cooler and document the temperature blank or ice water measurement

Cooler ID					
Temp (°C)	4.8				
Temp taken from	☑ Sample Bottle ☐ Cooler	☐ Sample Bottle ☐ Cooler	☐ Sample Bottle ☐ Cooler	☐ Sample Bottle ☐ Cooler	☐ Sample Bottle ☐ Cooler
Temp measured with	☑ IR gun ID: M3A ☐ Thermometer (enter ID):	☐ IR gun ID: M3A ☐ Thermometer (enter ID):	☐ IR gun ID: M3A ☐ Thermometer (enter ID):	☐ IR gun ID: M3A ☐ Thermometer (enter ID):	☐ IR gun ID: M3A ☐ Thermometer (enter ID):

Other Information:

Any discrepancies should be explained in the "Comments" section below.

CHECKLIST	YES	NO	NA
1. Were custody seals on shipping container(s) intact?			
2. Were custody papers properly included with samples?			
3. Were custody papers properly filled out (ink, signed, match labels)?			
4. Did all bottles arrive in good condition (unbroken)?			
5. Were all bottle labels complete (sample #, date, signed, analysis, preservatives)?			
6. Did the sample labels agree with the chain of custody?			
7. Were correct bottles used for the tests indicated?			
8. Were proper sample preservation techniques indicated on the label?			
9. Were samples received within holding times?			
10. Were all VOA vials free of the presence of air bubbles?			
11. Have all Soil VOA Vials and Encores been placed in a freezer within 48 hours of collection?			
12. Were samples in direct contact with wet ice? If "No," check one: ☐ NO ICE ☐ BLUE ICE			
13. Was the cooler temperature less than 6°C?			
14. Where pH preservation is required, are sample pHs checked and any anomalies recorded by Sample control? Are all <2 or >10? Note: VOA samples are checked by laboratory analysts.			
15. Was sufficient sample volume provided to perform all tests?			
16. If for Bacteriological testing, were containers supplied by AEL? (See QA officer if answer is no)			
17. Were all sample containers provided by AEL? (Other than Bacteriological)			
18. Were samples accepted into the laboratory?			
19. When necessary to split samples into other bottles, is it noted in the comments?			

Comments: (Note all sample(s) and container (s)" with a "No" checklist response in this comment section)

Client did not properly fill out chain of custody. There is no date/time of collection on COC. All HPC came in out of hold. Aer Inf @ 1455 AOP Eff 1456 BAC Eff #1 1458 BAC Eff #2 1500 BAC Eff #3 1502 BAC Eff #4 1504 all collected 4/28/21 and recieved 4/29/21 1545. and brought back to AEL 4/29/21 @ 1630.

DCN: AD-D048
Eff date 2/3/10, Last rev 9/6/16

Advanced Environmental Laboratories, Inc.

Work Order: M2101976
Client: Reiss Engineering, Inc.
Project ID: City of Ft Lauderdale Fiveash

I. Receipt

No Exceptions were encountered.

II. Holding Times

Preparation: All holding times were met.

Analysis: All holding times were met.

III. Method

Analysis: EPA 300.0

Preparation:

IV. Preparation

Sample preparation proceeded normally.

V. Analysis

Calibration: All acceptance criteria were met.

Blanks: All acceptance criteria were met.

Surrogates: All acceptance criteria were met.

Spikes: The matrix spike recovery of Sulfate for T2107836003 was outside control criteria. Recoveries in the Laboratory Control Sample (LCS), and %RPD were acceptable, which indicates the analytical batch was in control. No further corrective action was required.

Internal Standard: All acceptance criteria were met.

Samples: All acceptance criteria were met.

Other: All acceptance criteria were met.

Serial Dilution: All acceptance criteria were met.

Duplicates: All acceptance criteria were met.

Advanced Environmental Laboratories, Inc.

Work Order: M2101976
Client: Reiss Engineering, Inc.
Project ID: City of Ft Lauderdale Fiveash

I. Receipt

No Exceptions were encountered.

II. Holding Times

Preparation: All holding times were met.

Analysis: All holding times were met.

III. Method

Analysis: EPA 200.7

Preparation: EPA 200.7

IV. Preparation

Sample preparation proceeded normally.

V. Analysis

Calibration: All acceptance criteria were met.

Blanks: The Method Blank associated with batch 1318 contained low level concentrations of calcium and sodium above the Method Reporting Limit (MDL). The associated samples F2101835001, F2101835002, M2101962001, M2101964001, and A2103606001 contained these compounds at a concentration of at least ten times that found in the Method Blank. Blank contamination less than ten times that found in the associated samples is deemed insignificant and the data is reported with no further corrective action required.

Surrogates: All acceptance criteria were met.

Spikes The control criteria for matrix spike recoveries of sodium for F2101835001 are not applicable. The analyte concentration in the sample was greater than 4 times the added spike concentrations, preventing accurate evaluation of the spike recovery. No further corrective action was required.

Internal Standard: All acceptance criteria were met.

Samples: All acceptance criteria were met.

Other: All acceptance criteria were met.

Serial Dilution: All acceptance criteria were met.

Duplicates: All acceptance criteria were met.

Advanced Environmental Laboratories, Inc.

Work Order: M2101976
Client: Reiss Engineering, Inc.
Project ID: City of Ft Lauderdale Fiveash

I. Receipt

No Exceptions were encountered.

II. Holding Times

Preparation: All holding times were met.

Analysis: All holding times were met.

III. Method

Analysis: EPA 300.1

Preparation:

IV. Preparation

Sample preparation proceeded normally.

V. Analysis

Calibration: All acceptance criteria were met.

Blanks: All acceptance criteria were met.

Surrogates: All acceptance criteria were met.

Spikes: The control criteria for the matrix spike and matrix spike duplicate for sample T2107576006 are not applicable. The analysis of the sample(s) required a dilution, which resulted in the spike concentrations being out of range. The LCS recoveries are acceptable indicating the batch is in control.

Internal Standard: All acceptance criteria were met.

Samples: All acceptance criteria were met.

Other: All acceptance criteria were met.

Serial Dilution: All acceptance criteria were met.

Duplicates: All acceptance criteria were met.

Advanced Environmental Laboratories, Inc.

Work Order: M2101976
Client: Reiss Engineering, Inc.
Project ID: City of Ft Lauderdale Fiveash

I. Receipt

M2101976 was received by the lab past the recommended holding time. The analysis was performed as soon as possible after receipt by the laboratory. The data is qualified to indicate the holding time violation.

II. Holding Times

Preparation:	All holding times were met.
Analysis:	All holding times were met.

III. Method

Analysis:	SM 9215 B (Pour Plate)
Preparation:	

IV. Preparation

Sample preparation proceeded normally.

V. Analysis

Calibration:	All acceptance criteria were met.
Blanks:	Due to a laboratory error the method blank (MB) contained colonies Too Numerous To Count resulting in a concentration of 77850 cfu/ml. There was insufficient time and volume to reanalyze the samples. Samples M2101976022, 023, 024, 025, 026 and 027 results were cancelled as the data provided is unusable. Laboratory are working on corrective actions to prevent future contamination.
Surrogates:	All acceptance criteria were met.
Spikes	All acceptance criteria were met.
Internal Standard:	All acceptance criteria were met.
Samples:	All acceptance criteria were met.
Other:	All acceptance criteria were met.
Serial Dilution:	All acceptance criteria were met.
Duplicates:	All acceptance criteria were met.

Advanced Environmental Laboratories, Inc.

Work Order: M2101976
Client: Reiss Engineering, Inc.
Project ID: City of Ft Lauderdale Fiveash

I. Receipt

No Exceptions were encountered.

II. Holding Times

Preparation: All holding times were met.

Analysis: All holding times were met.

III. Method

Analysis: EPA 300.0

Preparation:

IV. Preparation

Sample preparation proceeded normally.

V. Analysis

Calibration: All acceptance criteria were met.

Blanks: All acceptance criteria were met.

Surrogates: All acceptance criteria were met.

Spikes: The matrix spike (MS) recoveries of Chloride for M2101976016 were outside control criteria. Recoveries in the Laboratory Control Sample (LCS) and % RPD were acceptable, which indicates the analytical batch was in control. The matrix spike outlier suggests a potential low bias in this matrix. The affected sample is qualified to indicate matrix interference.

Internal Standard: All acceptance criteria were met.

Samples: All acceptance criteria were met.

Other: All acceptance criteria were met.

Serial Dilution: All acceptance criteria were met.

Duplicates: All acceptance criteria were met.

Advanced Environmental Laboratories, Inc.

Advanced Environmental Laboratories, Inc
10200 USA Today Way Miramar, FL 33025
Payments: P.O. Box 551580 Jacksonville, FL 32255-1580
Phone: (954)889-2288
Fax: (954)889-2281

May 13, 2021

Christophe M. Robert
Reiss Engineering, Inc.
1016 Spring Villas Pt.
Winter Springs, FL 32708

RE: Workorder: M2101977 Ft lauderdale

Dear Christophe Robert:

Enclosed are the analytical results for sample(s) received by the laboratory on Thursday, April 29, 2021. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report. The analytical results for the samples contained in this report were submitted for analysis as outlined by the Chain of Custody and results pertain only to these samples.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Deb Griffith - Client Services Manager
DGriffith@aellab.com

Enclosures

CERTIFICATE OF ANALYSIS

NELAP Accredited E82535

Advanced Environmental Laboratories, Inc.

Advanced Environmental Laboratories, Inc
10200 USA Today Way Miramar, FL 33025
Payments: P.O. Box 551580 Jacksonville, FL 32255-1580
Phone: (954)889-2288
Fax: (954)889-2281

SAMPLE SUMMARY

Workorder: M2101977 Ft lauderdale

Lab ID	Sample ID	Matrix	Date Collected	Date Received
M2101977001	INF (RAW)	Drinking Water	4/13/2021 15:30	4/29/2021 16:30
M2101977002	EFF (AOP)	Drinking Water	4/13/2021 15:30	4/29/2021 16:30

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ANALYTICAL RESULTS

Workorder: M2101977 Ft lauderdale

Lab ID: **M2101977001** Date Received: 04/29/21 16:30 Matrix: Drinking Water
Sample ID: **INF (RAW)** Date Collected: 04/13/21 15:30

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: IC,E300.0,Water	Analytical Method: EPA 300.0							
Bromide	**0.20**	**U**	**mg/L**	**2**	1.0	0.20	5/6/2021 20:33	T
Analysis Desc: IC,E300.1,Water	Analytical Method: EPA 300.1							
Bromate	**3.8**	**U**	**ug/L**	**1**	10	3.8	5/11/2021 05:41	T
Analysis Desc: DOC,SM5310B,Water	Analytical Method: SM 5310B							
Dissolved Organic Carbon	**7.4**		**mg/L**	**1**	1.0	0.50	5/6/2021 19:32	T
Total Organic Carbon	**7.0**		**mg/L**	**1**	1.0	0.50	5/7/2021 18:53	T

Lab ID: **M2101977002** Date Received: 04/29/21 16:30 Matrix: Drinking Water
Sample ID: **EFF (AOP)** Date Collected: 04/13/21 15:30

Sample Description: Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
WET CHEMISTRY								
Analysis Desc: IC,E300.0,Water	Analytical Method: EPA 300.0							
Bromide	**0.20**	**U**	**mg/L**	**2**	1.0	0.20	5/6/2021 20:50	T
Analysis Desc: IC,E300.1,Water	Analytical Method: EPA 300.1							
Bromate	**3.8**	**U**	**ug/L**	**1**	10	3.8	5/11/2021 07:38	T
Analysis Desc: DOC,SM5310B,Water	Analytical Method: SM 5310B							
Dissolved Organic Carbon	**7.6**		**mg/L**	**1**	1.0	0.50	5/6/2021 19:45	T
Total Organic Carbon	**7.0**		**mg/L**	**1**	1.0	0.50	5/7/2021 19:06	T

CERTIFICATE OF ANALYSIS

NELAP Accredited E82535

Advanced Environmental Laboratories, Inc.

Advanced Environmental Laboratories, Inc
10200 USA Today Way Miramar, FL 33025
Payments: P.O. Box 551580 Jacksonville, FL 32255-1580
Phone: (954)889-2288
Fax: (954)889-2281

ANALYTICAL RESULTS QUALIFIERS

Workorder: M2101977 Ft lauderdale

PARAMETER QUALIFIERS

U	The compound was analyzed for but not detected.
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

LAB QUALIFIERS

T	DOH Certification #E84589(AEL-T)(FL NELAC Certification)

CERTIFICATE OF ANALYSIS

NELAP Accredited E82535

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Payments: P.O. Box 551580 Jacksonville, FL 32255-1580
Phone: (954)889-2288
Fax: (954)889-2281

QUALITY CONTROL DATA

Workorder: M2101977 Ft lauderdale

QC Batch: WCAt/3956 Analysis Method: SM 5310B
QC Batch Method: SM 5310B Prepared:
Associated Lab Samples: M2101977001, M2101977002

METHOD BLANK: 3877406

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Dissolved Organic Carbon	mg/L	0.50	0.50	U

QC Batch: WCAt/3984 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Prepared:
Associated Lab Samples: M2101977001, M2101977002

METHOD BLANK: 3878776

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Bromide	mg/L	0.10	0.10	U

QC Batch: WCAt/4000 Analysis Method: SM 5310B
QC Batch Method: SM 5310B Prepared:
Associated Lab Samples: M2101977001, M2101977002

METHOD BLANK: 3879441

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				
Total Organic Carbon	mg/L	0.50	0.50	U

QC Batch: WCAt/4141 Analysis Method: EPA 300.1
QC Batch Method: EPA 300.1 Prepared:
Associated Lab Samples: M2101977001, M2101977002

METHOD BLANK: 3885681

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
WET CHEMISTRY				

Advanced Environmental Laboratories, Inc.
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QUALITY CONTROL DATA

Workorder: M2101977 Ft lauderdale

METHOD BLANK: 3885681

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
Bromate	ug/L	3.8	3.8	U

Advanced Environmental Laboratories, Inc.
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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: M2101977 Ft lauderdale

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
M2101977001	INF (RAW)			SM 5310B	WCAt/3956
M2101977002	EFF (AOP)			SM 5310B	WCAt/3956
M2101977001	INF (RAW)			EPA 300.0	WCAt/3984
M2101977002	EFF (AOP)			EPA 300.0	WCAt/3984
M2101977001	INF (RAW)			SM 5310B	WCAt/4000
M2101977002	EFF (AOP)			SM 5310B	WCAt/4000
M2101977001	INF (RAW)			EPA 300.1	WCAt/4141
M2101977002	EFF (AOP)			EPA 300.1	WCAt/4141

Advanced Environmental Laboratories, Inc.
Florida's Largest Laboratory Network

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M2101977

Lab ID: E53076
E84482

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☐ Tampa: 9610 Princess Palm Ave., FL 33619 • 813.630.9616 • Fax 813.630.4327 Lab ID: E84589

Fax 850.219.6275 Lab ID: E811095

Client Name: Reiss Eng	Project Name: Ft Lauderdale
Address: 1016 Spring Villas Winter Springs, FL 32708	Project Number:
Phone: 407-679-5358	PO Number:
FAX:	FDEP Facility No:
Contact: Christophe Robert	FDEP Facility Address:
Sampled By: Antoine Sands	Special Instructions:
Turn Around Time: ☒ STANDARD ☐ RUSH	
AEL Profile #:	☐ ADaPT ☐ EQuIS ☐ Other

SAMPLE ID	SAMPLE DESCRIPTION	Grab Comp	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. COUNT	BOTTLE SIZE & TYPE	ANALYSIS REQUIRED: TOC	Bromate	Bromide	DOC							LABORATORY I.D. NUMBER
							Preservation											
							Field-Filtered?											
	Inf (Raw)	G	4/13/21	1530	DW	4		✓	✓	✓	✓							001
	Eff (AOP)	G	"	1530	DW	4		✓	✓	✓	✓							002

Matrix Code: WW = wastewater SW = surface water GW = ground water DW = drinking water O = oil A = air SO = soil SL = sludge
Preservation Code: I = ice H=(HCl) S = (H_2SO_4) N = (HNO_3) T = (Sodium Thiosulfate)

Received on Ice ☑ Yes ☐ No ☐ Temp taken from sample ☑ Temp from blank ☐ Where required, pH checked
Temp. when received (observed) 5.8 °C Temp. when received (corrected) 4.8 °C

DCN: AD-D051web Form last revised 08/07/2019
Device used for measuring Temp by unique identifier (circle IR temp gun used) J: 9A G: LT-1 T: 10A A: 3A M: 3A S: 1V F: 1A

	Relinquished by:	Date	Time	Received by:	Date	Time
1	[signature]	4/14/21	1545	[signature] for GEVANS	4/14/21	1545
2	G. Evans by [signature]	4/14/21	1630	[signature]	4/14/21	1630
3						
4				Site Address:		

FOR DRINKING WATER USE:
(When PWS Information not otherwise supplied) PWS ID:
Contact Person: Phone :
Supplier of Water:
Site Address:

NELAP Accredited E82535

Thursday, May 13, 2021 1:20:29 PM
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Attachment E – Ozone Equipment Quotation

Proposal Prepared For:	Contact 1: **Pat Kanis**
Ed Talton Reiss, a CHA Company 407-492-0980 ETalton@chacompanies.com	Industrial Sales Manager *DE NORA WATER TECHNOLOGIES* mobile: +1 412 303-0400 e-mail: pat.kanis@denora.com website: www.denora.com Contact 2: **Jason Kurrle** **South Florida Account Manager** TriNova-Florida Office 2401 Drane Field Road Lakeland, FL 33811 786-525-9962 Cell | 863-682-4500 Office Jason.Kurrle@TriNovainc.com

Offer # P108773

Fort Lauderdale Ozone Budget

45 MGD Potable Water Plant

00	Quotation	7/15/2021	Abby Momorella
REV	ISSUE FOR	DATE	ISSUED BY

Table of Contents

1. ABOUT CAPITAL CONTROLS OZONE

- Founded in 1970
- Part of De Nora Group since May 2015
- More than 45 years of market presence
- More than 1300 worldwide installations in municipal and industrial applications
- North American branch and support center located in Colmar, PA

Drinking Water Treatment Plant - 3 x 620 PPD

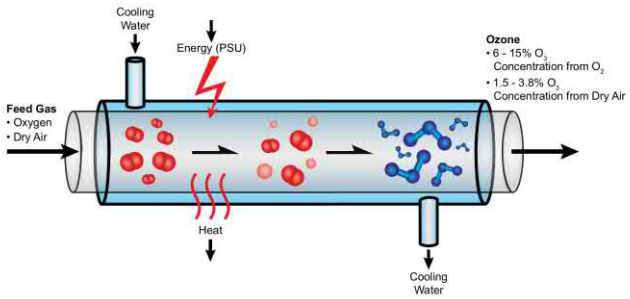
2. PROCESS DESCRIPTION

2.1 Ozone Generation Principles

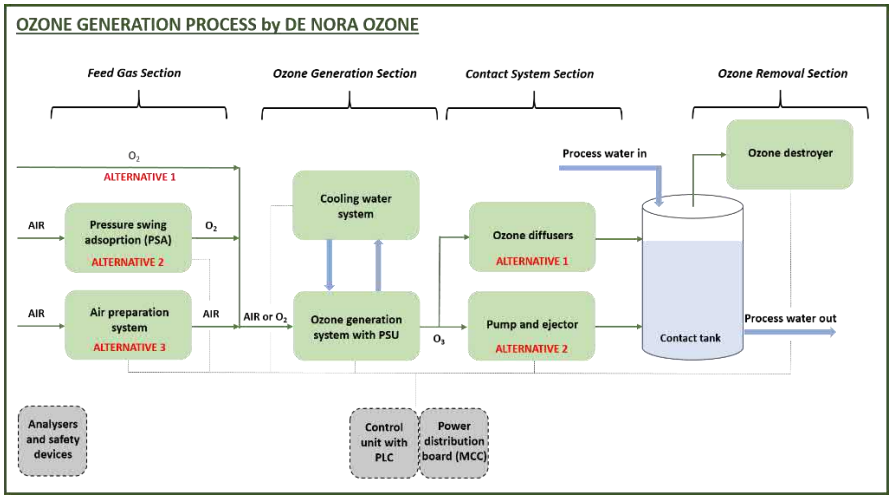
Ozone, or trioxygen, is an inorganic molecule with the chemical formula O_3. It is a pale blue gas with a distinctively pungent smell.

- Molecular weight : 48 g/mol
- Density @ 1013 mbar, 0°C : 2.14 kg/m³
- Max. limit for ambient level : 0.1 ppm (0.2 mg/m³air)
- Odor threshold : 0.01 ppm
- Redox potential : 2.07 V

Ozone is formed by a chemical reaction of oxygen molecules and oxygen atoms. The reaction is initiated by supplying energy to decompose the oxygen molecule. De Nora Ozone technology is based on energy supplied by an electric field, namely a corona discharge, where the electrical field is created between the grounded electrode, the dielectric material, and the high voltage electrode.



In the block diagram here below a typical ozone generation process is shown, De Nora Ozone can supply all or parts of the below process:



3. DESIGN DATA

Object of the present offer is a complete ozone system package, designed per the following design data and as project specs and technical drawings:

Plant Data		
Application	Municipal Potable	
Max plant flow (basis of this proposal)	45	MGD
Max ozone dose (basis of this proposal)	6	mg/l
Number of ozone generation lines installed	2	
Number of lines working (duty/spare)	1/1	
Ozone generation feed gas	LOX	
Feed gas volumetric flow (design conditions, per unit)	179.5	scfm
Total ozone production, nominal (based on duty /standby)	2250	PPD
Ozone production each line, nominal	2250	PPD
Total ozone capacity (each unit), max @ 10%	2292	PPD
Nominal ozone concentration	10	% wt
Cooling Water temperature (max inlet)	80	°F
Cooling Water flowrate total, nominal	439	GPM
Total adsorbed power (80°F cooling water)	358	kW
PSU Cooling Type	Water Cooled	

3.1 Environmental design conditions

• Location	Florida, USA	
• Relative humidity	< 80	%
• Dust	< 5	mg/l
• Altitude	<500	m above sea level
• Temperature min / max	+41 / +110	°F
• Corrosive gas and vapor	absent	
• Available electric supply	480 V / 3pH / 60Hz	
• Area classification	safe area	

3.2 Codes and standards

Pressure vessels	ASME VIII Cat.1 - Stamped
Electrical equipment and panels	UL
Motors	NEMA
Piping and flanges	ASME – ANSI 150
Instrumentation	NEMA
Centrifugal Pumps	Manufacturer's standard
Compressors	Manufacturer's standard
Air Blowers	Manufacturer's standard

4. SCOPE OF SUPPLY

Included in De Nora scope of supply:

DESCRIPTION	MODEL/TYPE	Qty
Oxygen Feed System	LOX Tank + Vaporizer	2 x 100%
Nitrogen Feed System	Compressor+ Filters +Dryer	2 x 100%
Ozone Generator	DTPF308-XTL-O	2 x 100%
Power Supply Unit	DTPF308-XTL-O	2 x 100%
Cooling Water System	Closed Loop HEX	2 x 100%
Contact System	Side-Stream Injection	2 x 100%
Ozone destruction System	DOCAT320	2 x 100%
Main PLC	Allen Bradley	1 x 100%
Ambient Ozone Gas Monitor	Electrochemical Cell	2
Ambient Oxygen Gas Monitor	Electrochemical Cell	2
Medium Concentration Ozone Off-Gas Monitor	UV Type	2
High Concentration Ozone Monitor	UV Type	2
Dissolved Ozone Monitor	Flow Type	2
Dew Point Monitor		2

Test and Certificates

- According to De Nora Water Technologies Standards

Documentation:

- According to De Nora Water Technologies Standards

5. TECHNICAL DATA SHEETS

5.1 Supplemental Nitrogen Feed System – skid-mounted system

Provided to introduce a small stream of air into the gaseous oxygen line upstream of the ozone generators.

- #2 Air cooled oil-free rotary compressor, with air intake filter
- #2 Air Filters set – #1 Pre-dryer coalescing filter + #1 Post-desiccant dryer particulate filter
- #1 Desiccant dryer
- #1 Vertical Air receiver tank, ASME Stamped with auto drain

Rotary compressors	2 x 100%	
Type	Scroll type - Oil Free	
Volumetric flow max	10	scfm
Operating pressure	90	psig
Electrical supply	480V 3ph 60 Hz	
Air Receiver tanks	1 x 100%	
Capacity	TBC	gallon
Desiccant dryer	1 x 100%	
Type	Desiccant – double column	
Dry air dew-point	-100	°F
Operating pressure	100	psig

5.2 LOX Tank, Vaporizers, Instruments

Vertical 10,000-gallon storage vessel	**2 x 100%**
Inner vessel	
ASME 175 PSI MAWP	
Operating pressure 100 psi	
SA240 T304 stainless steel inner vessel built	
NBIC registered inner vessel	
Inner vessel design temperature -320 °F to 120 °F	
Outer vessel	
Jacket material per CGA341	
Seismic design per UBC 1997 and ASCE 7-05	
Designed for 150 MPH wind loads	
Paint with standard paint system	
Tank mounted piping including	
Top and bottom Fill circuit with manual isolation valves	
Dual ASME safety circuit	
Liquid withdrawal circuit with manual isolation valves	
Analog pressure and level gauge circuit	
Digital Pressure and Level Transmitters	
Valves and components are brass/bronze	
Ambient Vaporizers - Thermax SG50HF	**2 x 100%**
1 x Vaporizer Switching Manifold	
2 x ASME Rated RVs	
1 x Bronze Diverter Valve 2in/1outlet	
1 x Timer Panel	
Pre-piped and spooled	
Mounted to Frame	

Liquid oxygen storage and evaporation system

5.3 Ozone generator

Purpose

Inside the ozone generator vessel Ozone will be produced from Oxygen present in the feed gas by means of a silent electric discharge (non-thermal plasma).

Construction

The Capital Controls ozone generator consists of a cylindrical vessel in which a specific number of stainless steel tubes in a compact arrangement are welded between two fixed type plates. Around the outside of these steel tubes (shell side) a coolant (water) removes the heat dissipated by the ozone formation process. This arrangement avoids any possible contact of the coolant with the high voltage loaded electrodes. The steel tubes (connected to the ground potential) serve as one electrode for the calibrated glass tubes that have an inside metalized surface. The steel tube's inside diameter and the glass tubes outside diameter correspond to establish a predictable gap width, in which the Ozone is formed with high efficiency.

Each Ozone generating element has its own fuse which ensures the selective disconnection of a defective/damaged element.

Model DTPF308-XTL-O	2 x 100%	
Feed gas	O_2 by LOX	
Oxygen Flow	175	scfm
Nitrogen Flow	4.5	scfm
Ozone production design	2250	PPD O_3
Turndown range	5 – 100%	
Ozone concentration	10	%
Ozone vessel operating pressure	18.9	psig
Vessel cooling water demand (per unit)	392	GPM
Cooling water inlet temperature	80	°F
Cooling water outlet temperature	85.5	°F
Vessel features		
Material of construction	SS316L	
Vessel arrangement	horizontal	
Design pressure	36.3	psig
Design temperature, min / max	41 / 122	°F
Dielectric thickness	0.06	in
Dielectric material of construction	borosilicate glass tube	
Dielectric number	616	
Breakdown voltage of dielectric	91	kV
Operating voltage	9-9.5	kV
Protection on dielectric	HT fuse for each dielectric	
Reaction time of fuse	< 5	ms
Operating frequency fixed at	1000 ± 300	Hz

5.4 PSU (Power Supply Unit)

Purpose

The PSU System converts electrical energy supplied from the customer power grid to an operating condition which is appropriate to generate Ozone via an electrical field inside the Ozone vessel. Additionally, the PSU ensures that all important process and electrical parameters are continuously monitored.

Mechanical Design

The power supply unit (PSU) is arranged on a painted carbon steel base frame. Side by side and back to back mounted cabinets are completely wired and electrically checked. The system configuration incorporates an incoming power filter, a parallel connected, air cooled standard inverter with specific Capital Controls firmware. This arrangement is converting a three-phase power line supply into a one phase feeding line with an adjustable operating frequency (factory adjusted by Capital Controls) which is than supplied to the integrated step up transformer. From this transformer, a medium voltage cable supplies the energy to the ozone vessel. Power is controlled by increasing the inverter output voltage by means of pulse width modulation. Downstream installed magnetic parts ensure that the there is a balanced load for the parallel working inverters and that a filtered signal is finally supplied to the step-up transformer.

Power Supply Unit	2 x 100%	
Maximum absorbed power @80°F of cooling water	358	kW
IP protection rating	54	(NEMA 3S)
Electric voltage supply	3 x 480 V +/- 10%	
Electric frequency supply	60	Hz
Cooling method	Water Cooled	
PSU Cooling Flow Rate	47	GPM
Automatic controls		
PLC Type	Allen-Bradley CompactLogix PLC and Touch Panel (PanelView Plus 600)	
Communication Network	Ethernet TCP-IP	
Hardwired interface		
Remote set-point	AI (analogue input), 4- 20 mA	
Remote Start/Stop	DI (digital input)	
Collective Warning	DO (digital output)	
Collective Alarm	DO	
Safety Circuit Inactivation	DO	
Emergency Stop Executed	DO	
Normal operation of ozone sys.	DO	

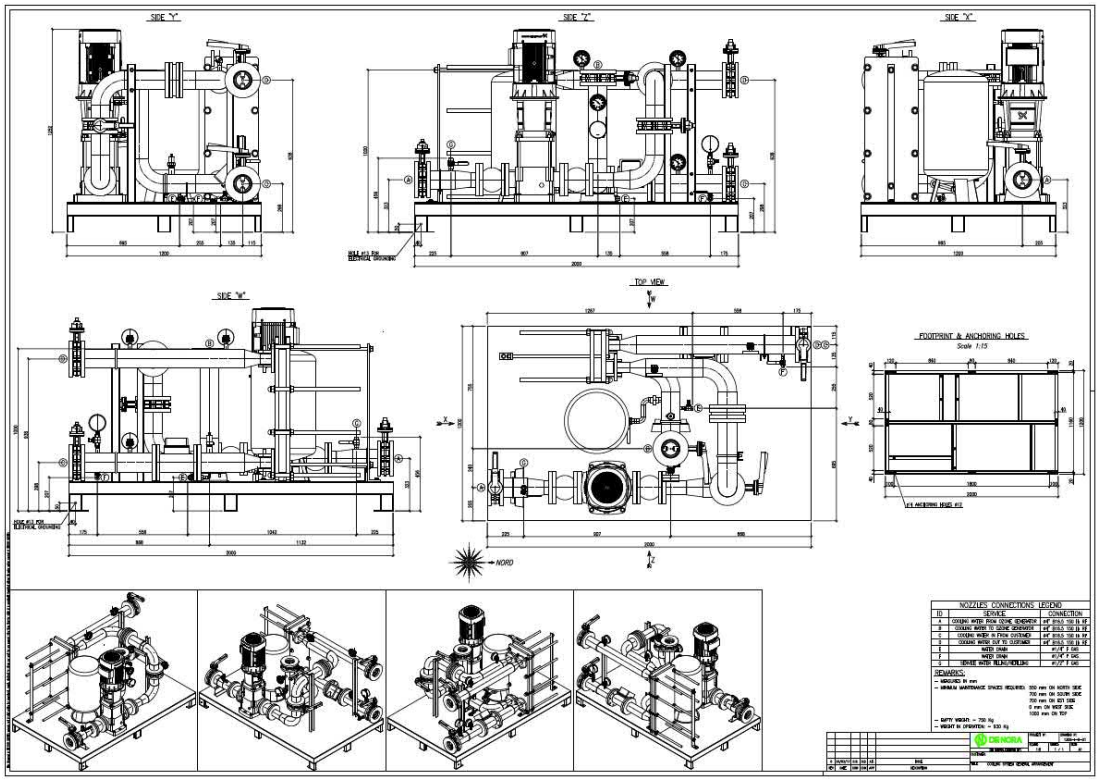
5.5 Cooling Water System – Close loop system with plate heat exchanger

Skid-mounted system, including:

- Recirculation pump, centrifugal type
- Plate and frame heat exchanger
- Valves and instruments as per specs and contract drawings
- Chemical Pot feeder
- Expansion tank

Plate and Frame Heat Exchanger	2 x 100%	
Cold side water temperature IN	TBD	°F (open loop side)
Cold side water temperature OUT	TBD	°F (open loop side)
Cold side water flow rate	439	GPM (open loop side)
Hot side water temperature IN	85.5	°F (close loop side)
Hot side water temperature OUT	80	°F (close loop side)
Design temperature	190	°F
Plate material	SS316L	
Recirculation Pump	2 x 100%	
Type	Centrifugal	
Vendor	Grundfos or equivalent	
Pressure	TBD	psig
Installed power	TBD	kW

typical close loop cooling system skid



Typical close loop cooling system skid – STD general arrangement

5.6 Ozone Contact System – Skid-Mounted Side-stream Injection System

The ozone dissolution system includes:

- #2 SS316L ozone gas injector
- #2 SS316L degas separator
- #2 SS316L gas relief valve
- #2 SS316L ozone diffuser nozzle manifold
- #3 side-stream booster centrifugal pumps with VFD
- #1 pipeline flash reactors
- Valves and instruments as per project specs and technical drawings

Mazzei Side-stream injection system	2 x 100%	
Applied Ozone dosage	6	mg/l
Material of Construction	SS316L	
Interconnecting piping material	SS316L	
Ozone transfer performance	90 +/- 2	%
	85	°F
Side-Stream Booster Pump	3 x 100%	
Pump type	Centrifugal	
Pumps efficiency	>70	%

Typical Mazzei Injection Skid

5.7 Ozone Destruct System

The ozone destruct system includes:

- Skid mounted ozone destruct unit including pre-heater, destruct vessel with catalyst, blower with silencer, valves and instrumentation as per specs and contract drawings
- SS316L Demister
- SS316L Pressure vacuum relief valve

Ozone destruct DOCAT320®	2 x 100%	
Material of construction	SS316L	
Catalyst	carulite	
Max volumetric flowrate	199	scfm
Gas inlet temperature range	40-100	°F
Outlet ozone concentration	≤ 0.1	ppm
Total power consumption	410	kW
Electrical supply	480V 3ph 60 Hz	
Blower	With silencer	

Thermal-Catalytic ozone destroyers DOCAT series

5.8 Main Ozone Control panel

Technical Data	
Brand & Type	De Nora
Country of origin	USA
Number of units	1
PLC	Allen Bradley ControlLogix
HMI	Allen Bradley PanelView Plus 1000 color
Communication protocol	Ethernet TCP/IP
Main power supply	120/230V 1 ph 60 Hz
Cooling	Air Conditioning
Compliance rules	UL
Cabinet	NEMA12

5.9 Analyzers and Safety Devices

Ambient oxygen leak detector	#2
Manufacturer	ATI
Measuring principle	Electrochemical
Sensor	Electrochemical cell
Measuring range	0-5/25% O_2
Measuring units	ppm
Accuracy /Linearity	< 0.5 % (Electronic)
Display	digital
Analog output	4÷20 mA 0-10 VDC
Supply voltage	12-24 VDC, 115 or 230 VAC, 50-60 Hz
Environmental operating condition	-30 /+ 60 °C, 10-95 % RH
Protection class	IP 65

Ambient ozone leak detector	#2
Manufacturer	ATI
Measuring principle	Electrochemical
Sensor	Electrochemical cell
Measuring range	0-5/200ppm O_3
Measuring units	ppm
Accuracy /Linearity	< 0.5 % (Electronic)
Display	digital
Analog output	4÷20 mA 0-10 VDC
Supply voltage	12-24 VDC, 115 or 230 VAC, 50-60 Hz
Environmental operating condition	-30 /+ 60 °C, 10-95 % RH
Protection class	IP 65

High concentration ozone monitor	#2
Manufacturer	Teledyne
Measuring principle	UV absorption type @ 254 nm wavelength
Measuring range	0 – 25% by weight
Measuring units	g/Nm^3, % w/w
Accuracy	± 1% of full scale
Precision/Repeatability	± 0.5% of full scale
Display Resolution	0.01% wt
Gas flow rate	0.2 - 2.0 L/min
Response time	< 30 seconds to 95%
Gas Inlet Pressure Range	3.0 - 30.0 psig
Analog output	4-20 mA 0 ÷ 10 VDC
Display	alpha-numeric characters
Supply voltage	100 - 240 VAC, 50 - 60 Hz
Enclosure	NEMA 4X

Medium concentration ozone monitor	#2
Manufacturer	Teledyne
Measuring principle	UV absorption type
Measuring range	0 – 5% by weight and 0 – 10.000 ppm
Measuring units	g/Nm^3, % w/w
Accuracy	± 1% of full scale
Precision/Repeatability	± 0.5% of full scale
Display Resolution	0.001% wt
Gas flow rate	0.2 - 2.0 L/min
Response time	< 45 seconds to 95%
Gas Inlet Pressure Range	3.0 - 30.0 psig
Analog output	4-20 mA 0 ÷ 10 VDC
Supply voltage	100 - 240 VAC, 50 - 60 Hz
Enclosure	NEMA 4X

Dissolved Ozone Monitor	# 2
Manufacturer	ATI
Measuring range	0-200 ppb, 0-2 ppm, 0-20 ppm, 0-200 ppm
Measuring units	ppm
Accuracy /Repeatability	± 0.01 ppm/ ± 0.01 ppm
Zero Drift	<0.01 ppm/month
Display	Digital LCD with LED back light
Analog outputs	Two Isolated 4-20 mA
Relay Output	Three SPDT, contacts rated 6 amp @20 VAC
Supply voltage	12-24 VDC or 100-240 VAC, 50/60 Hz
Enclosure	NEMA 4X Polycarbonate, V-0 flammability
Environmental operating condition	0-60 °C
Protection class	IP 66
Weight	6 lbs. with sensor, flowcell & accessories
Sensor	Membrane-covered Polargraphic
Sensor Cable	25 ft. standard, 100 ft. max with junction box
Sample Temperature	0-50 °C
Sample Connections	¼" I.D. hose barb inlet, ½" I.D. hose drain

6. FEED GAS FEATURES

NITROGEN		
Max Hydrocarbons concentration	≤ 60	ppm
Dew point	-100	°F
Dust (solids) concentration	≤ 1	ppm
Dust (solids) particle size	≤ 1	µm
Freon or other solvents	none	
Delivery pressure (before O3 gen. pressure reducer)	72	psig
Gas temperature	41-86	°F

OXYGEN		
Max Hydrocarbons concentration	≤ 60	ppm
Dew point	-100	°F
Dust (solids) concentration	≤ 1	ppm
Dust (solids) particle size	≤ 1	µm
Freon or other solvents	none	
Delivery pressure (before O3 gen. pressure reducer)	72	psig
Gas temperature	41-86	°F

7. UTILITIES REQUIREMENTS

7.1 Electrical Supplies

Power supply : 480 V / 60 Hz / 3 PH

8. DEVIATIONS AND CLARIFICATIONS LIST

- **On-site services are not included in pricing at this phase, can be added upon request**

9. VENDOR LIST

CATEGORY/ITEM	VENDOR	COUNTRY OF ORGIN
O_3 Generator	Capital Controls Ozone	Italy
PLC	Allen Bradley	USA
LOX System	Chart	USA
Air Preparation System	Kaesar	Germany
Plate and frame heat exchanger	Alfa Laval	Sweden
Centrifugal Pumps	Grundfos	Denmark
High concentration ozone monitor, Medium concentration off-gas ozone monitor	Teledyne	USA
Ambient ozone and oxygen gas monitors	ATI	USA
Dissolved Ozone Monitor	ATI	USA
Process instrumentation and valves	Omal or Equivalent	Italy
Side-Stream Injection System	Mazzei	USA

10. COMMERCIAL SECTION

SCOPE OF SUPPLY			
ITEM	**QTY.**	**DESCRIPTION**	
Ozone System Package	**As per "scope of supply" section**	As per this technical and commercial proposal	
TOTAL BUDGETARY PRICE			**$4,505,000.00**

TERMS AND CONDITIONS

PRICE:	ROM
DELIVERY TIME	20 to 26 weeks from technical drawings approval (technical drawings approval process: 4 to 6 weeks)
DELIVERY	ExWorks, Colmar PA
PACKING	Included
PAYMENT TERMS	*TBD*
OFFER VALIDITY	60 days
WARRANTY	As per project specs
TERMS & CONDITIONS	https://www.denora.com/dam/jcr:9b2166a0-3017-43e5-b3fd-9306a59b1017/De%20Nora%20U.S.%20Standard%20Sale%20Terms%20-%20Revised%207.9.2021.pdf